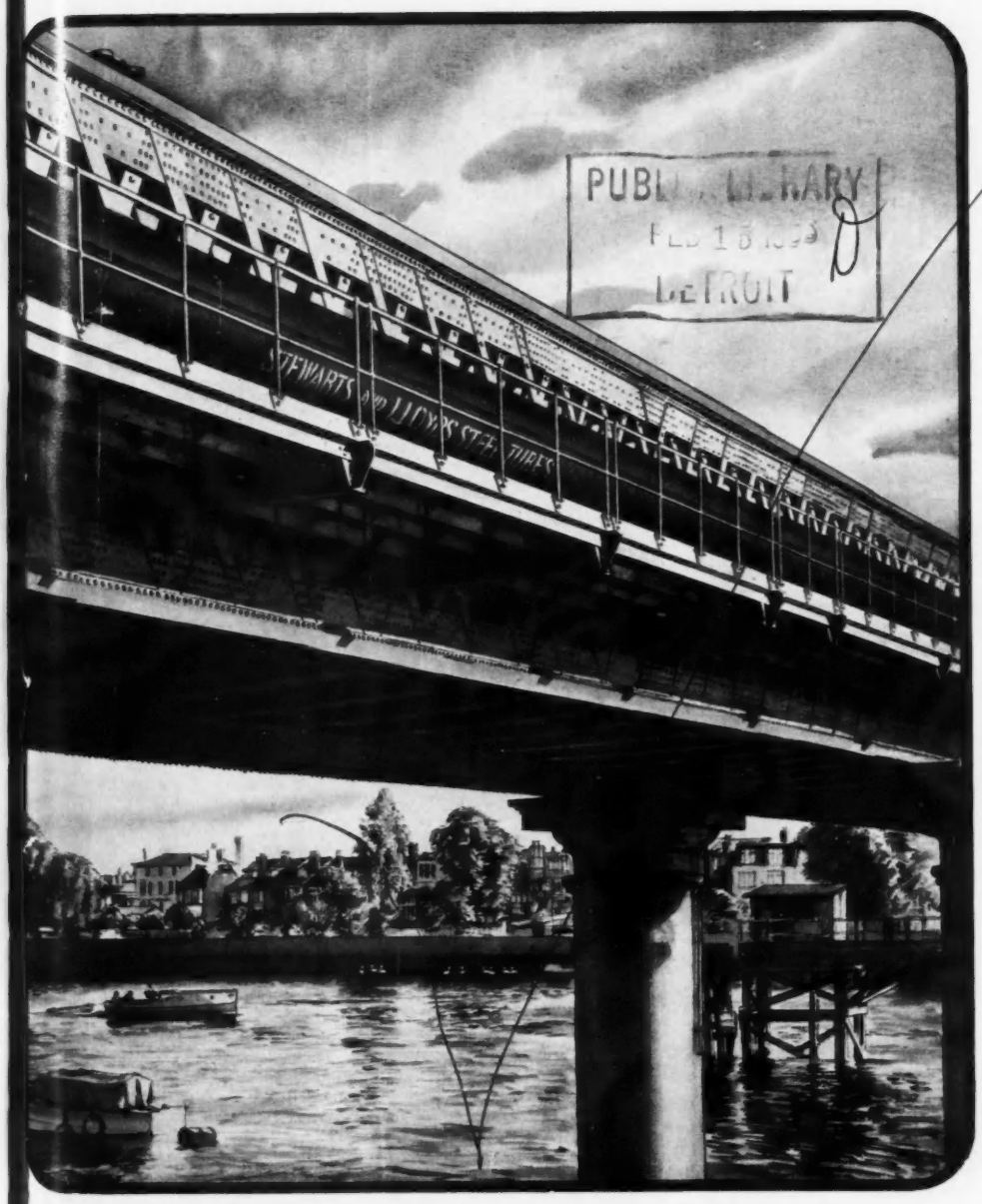
TECHNOLOGY DEPT

Gas Journal

VOL. 285. 108th YEAR. LONDON, JANUARY 25, 1956. Nº 4834. PRICE 1/6



THE STEEL TUBE AGE

An S & L steel gas main, 36¾ in. outside diameter by $\frac{5}{16}$ in. thick, installed by the North Thames Gas Board, across the River Thames at Putney. The main was internally protected with boiled linseed oil and externally with our standard red primer.

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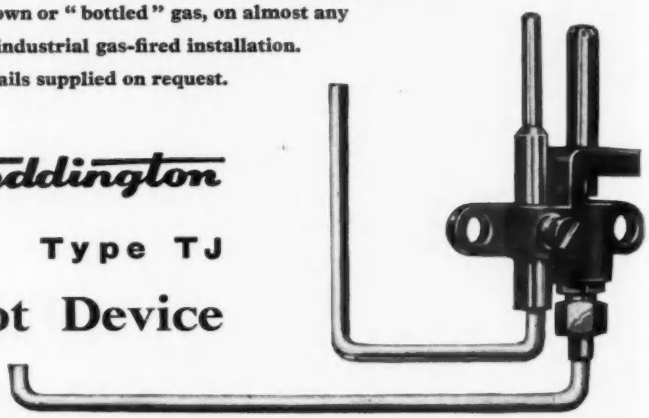
The Teddington TJ Pilot Device withholds gas from main burner till pilot is properly alight, and cuts it off from both burners if pilot is extinguished. Can be used with either town or "bottled" gas, on almost any type of industrial gas-fired installation. Full details supplied on request.



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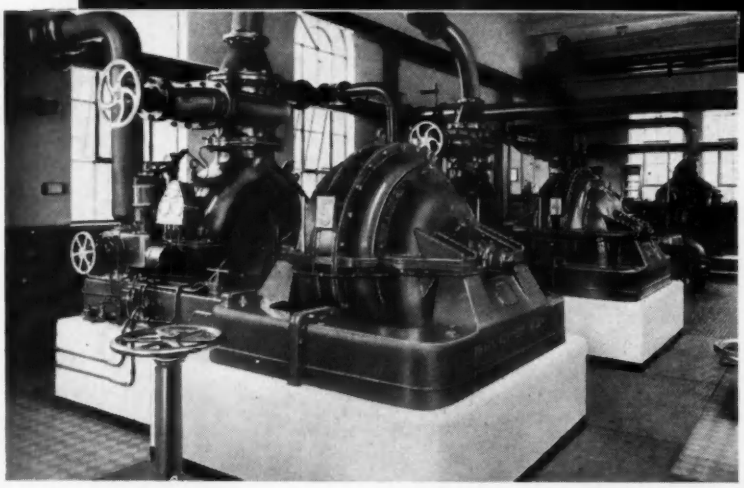

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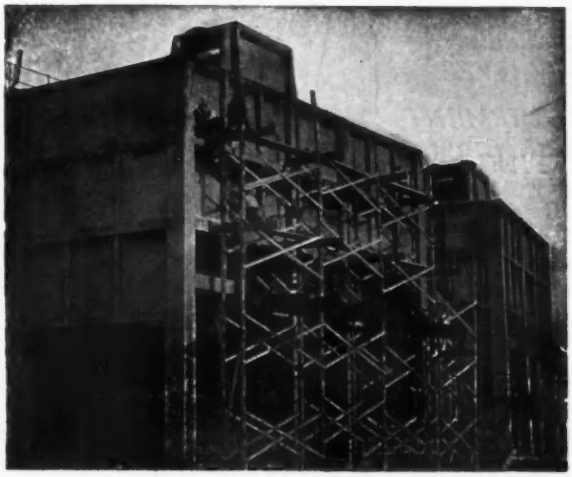

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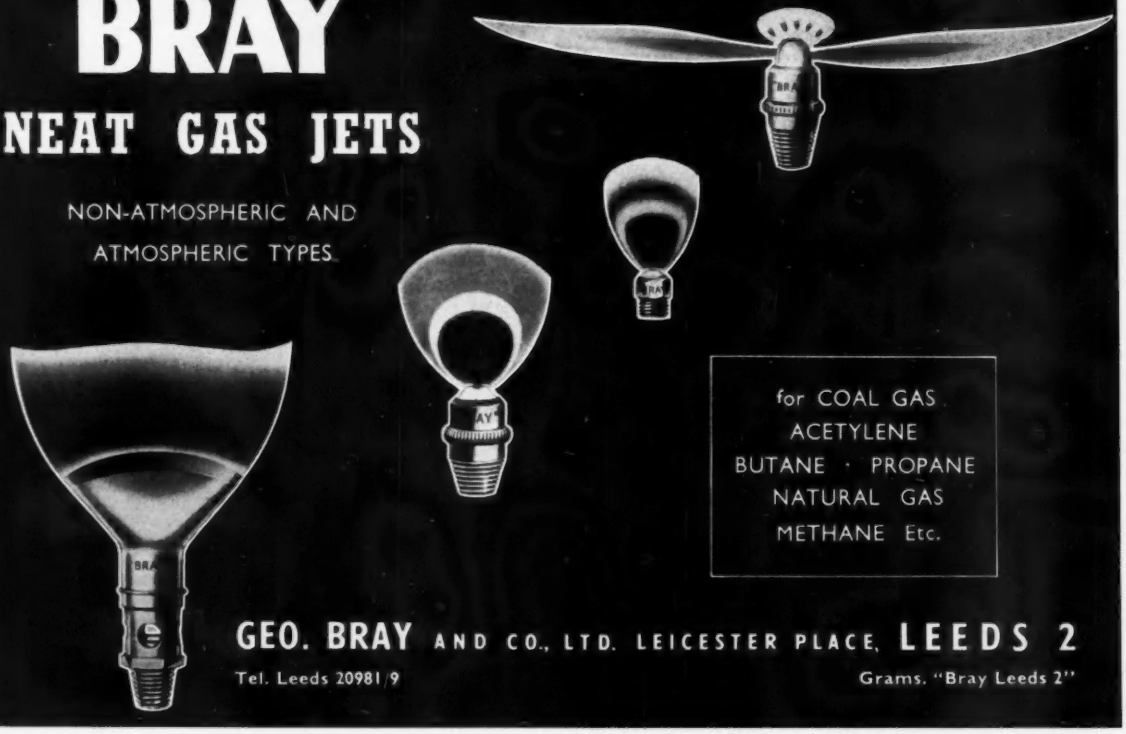

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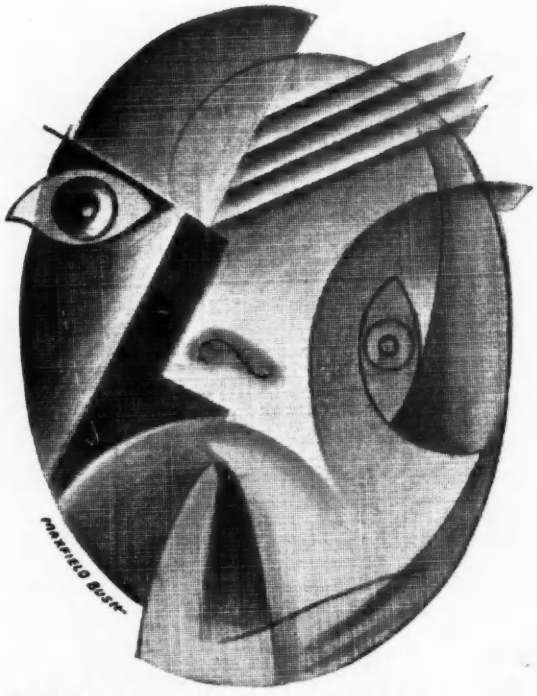

If only his methods had been as futuristic as his portrait, he wouldn't be wearing that anxious look. Nowadays, of course, nobody need get worried about locating lost pipes, covers etc. you just leave it to the Cintel Portable Metal Detector.

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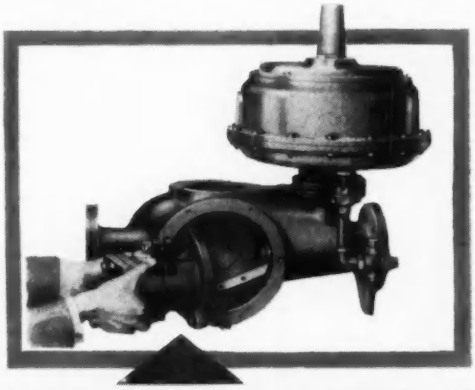

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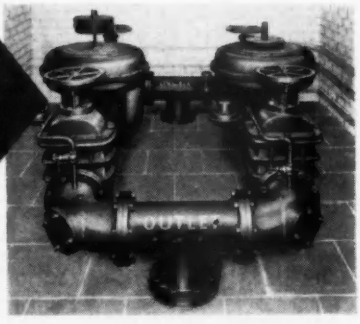

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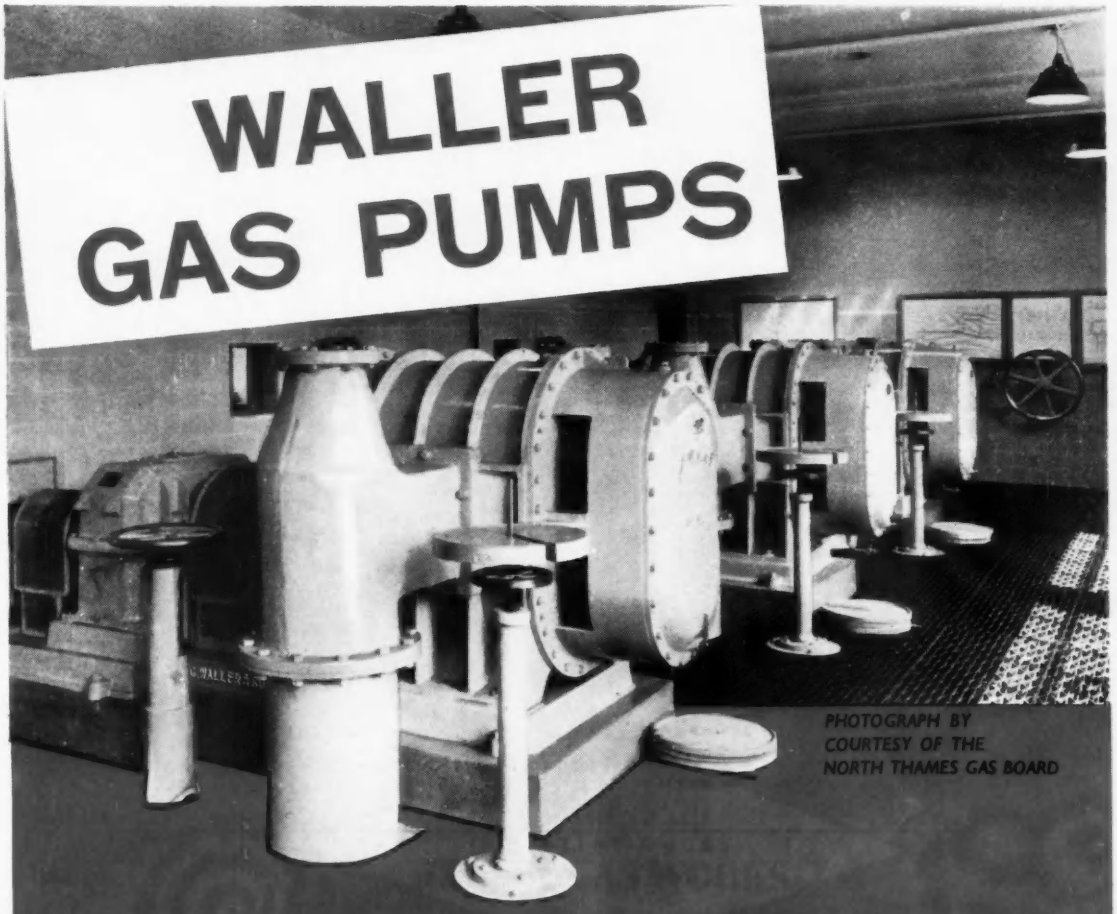

PHOTOGRAPH BY COURTESY OF THE NORTH THAMES GAS BOARD

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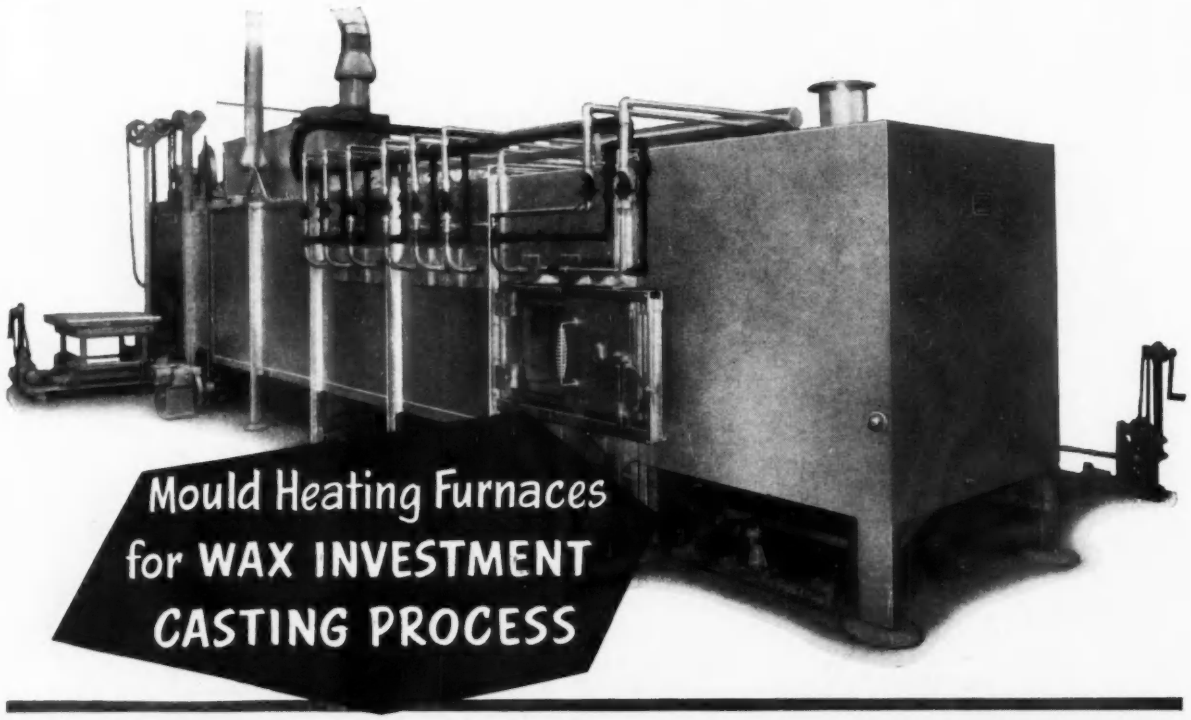

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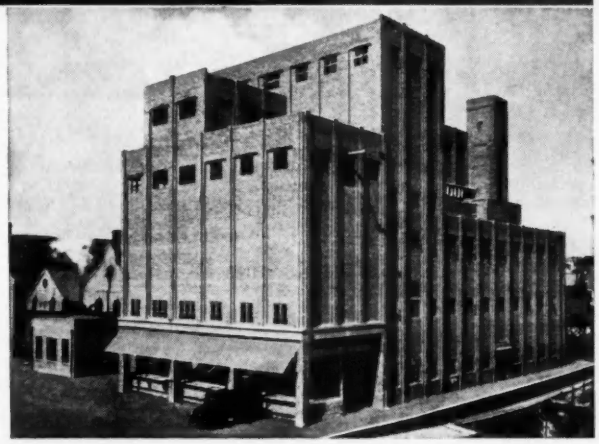

The illustration above shows the exterior view of the Jersey Gas Works, at St. Helier.

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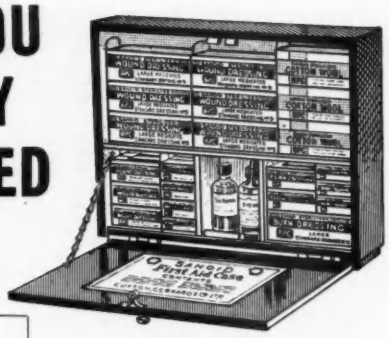

The First Aid Outfit illustrated is in accordance with S.R. & O. 1938, No. 486 (Standard outfit B) for concerns in which mechanical power is used, and in which the number of persons employed exceeds ten but does not exceed fifty.

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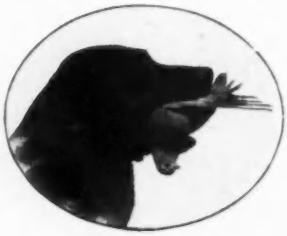

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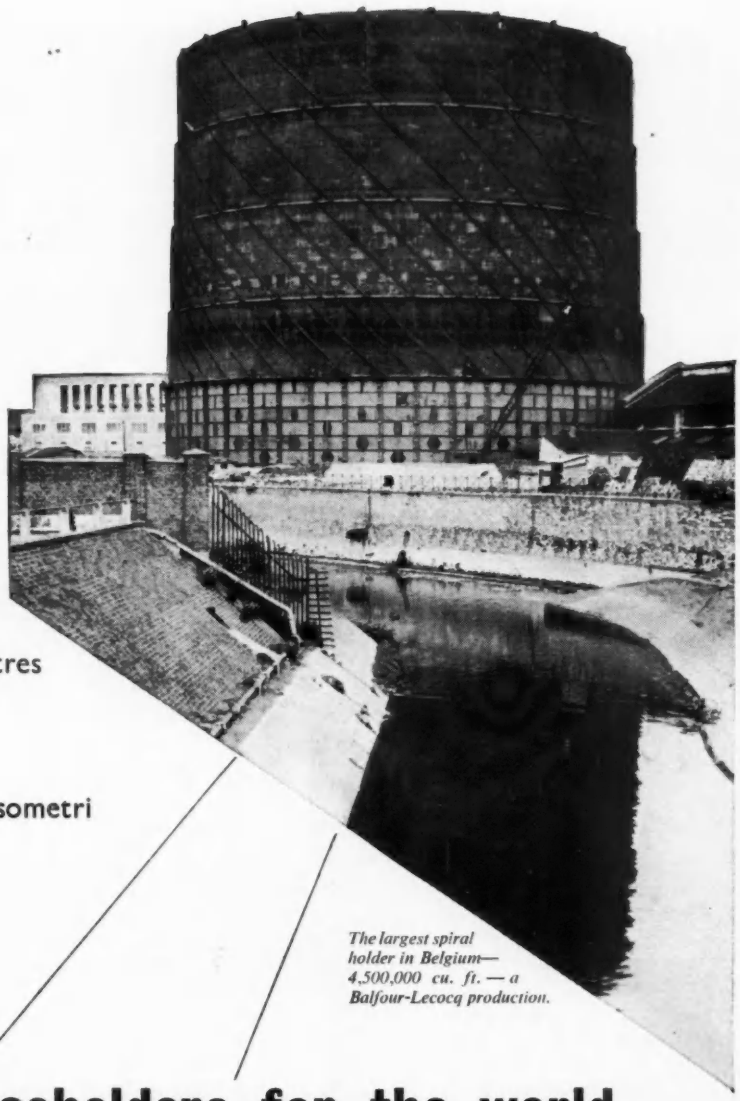

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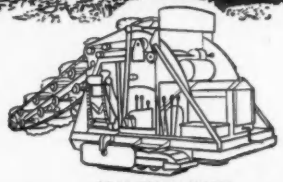

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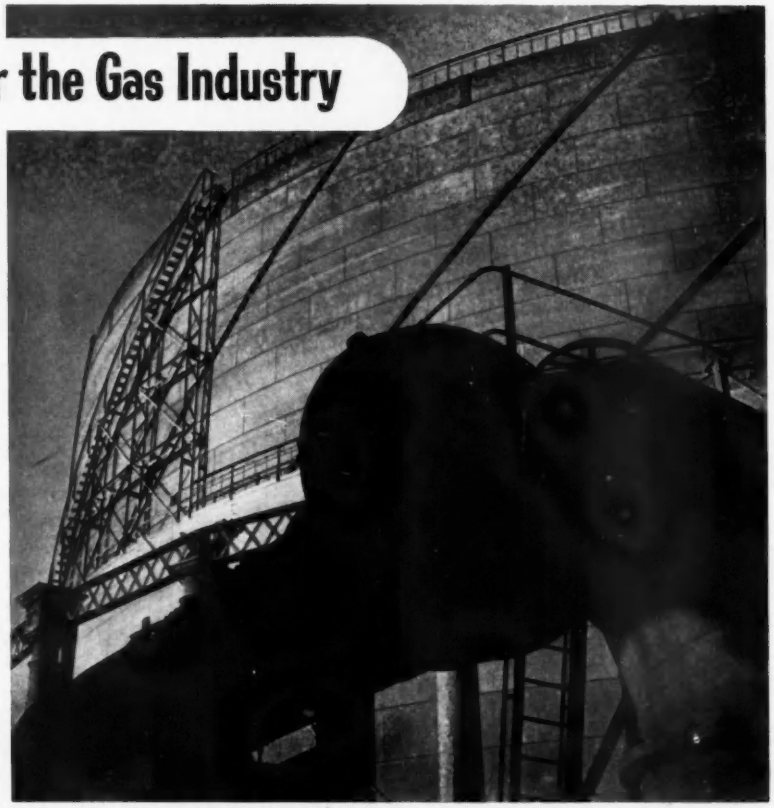
Photograph by courtesy of the Gas Council



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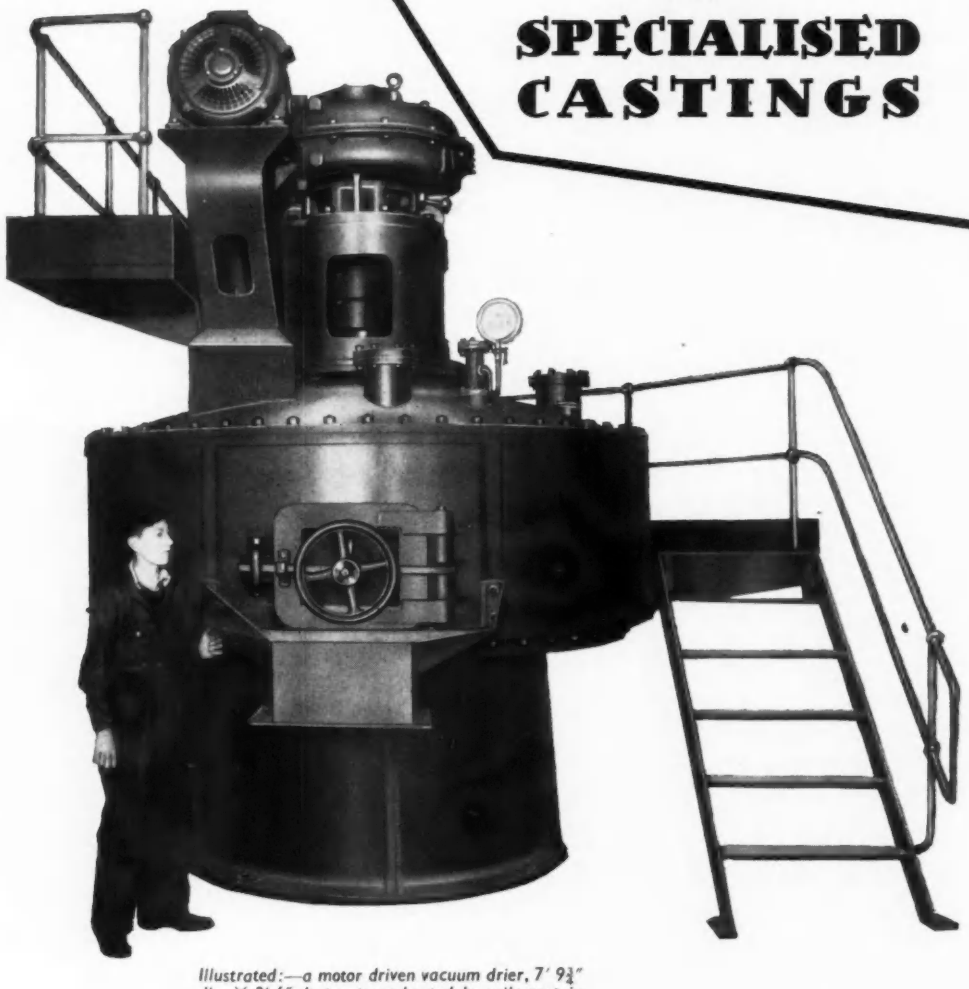

Illustrated:—a motor driven vacuum drier, 7′ 9¾″ dia. × 2′ 6″ deep; steam heated by coils cast in the body and base.

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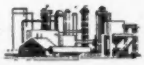
... refining sugar  or petroleum

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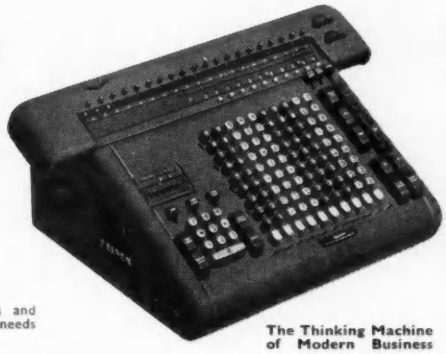

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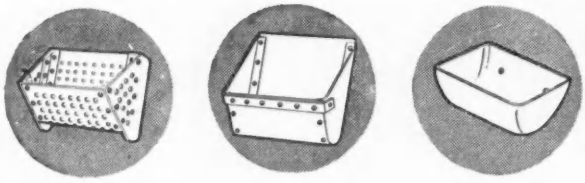

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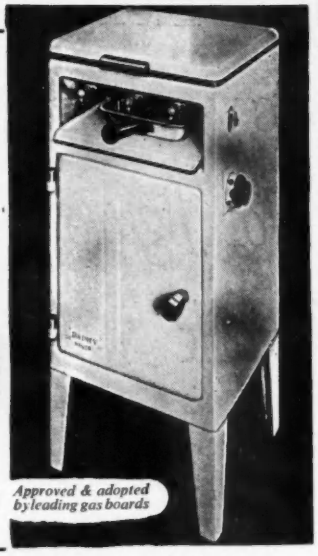

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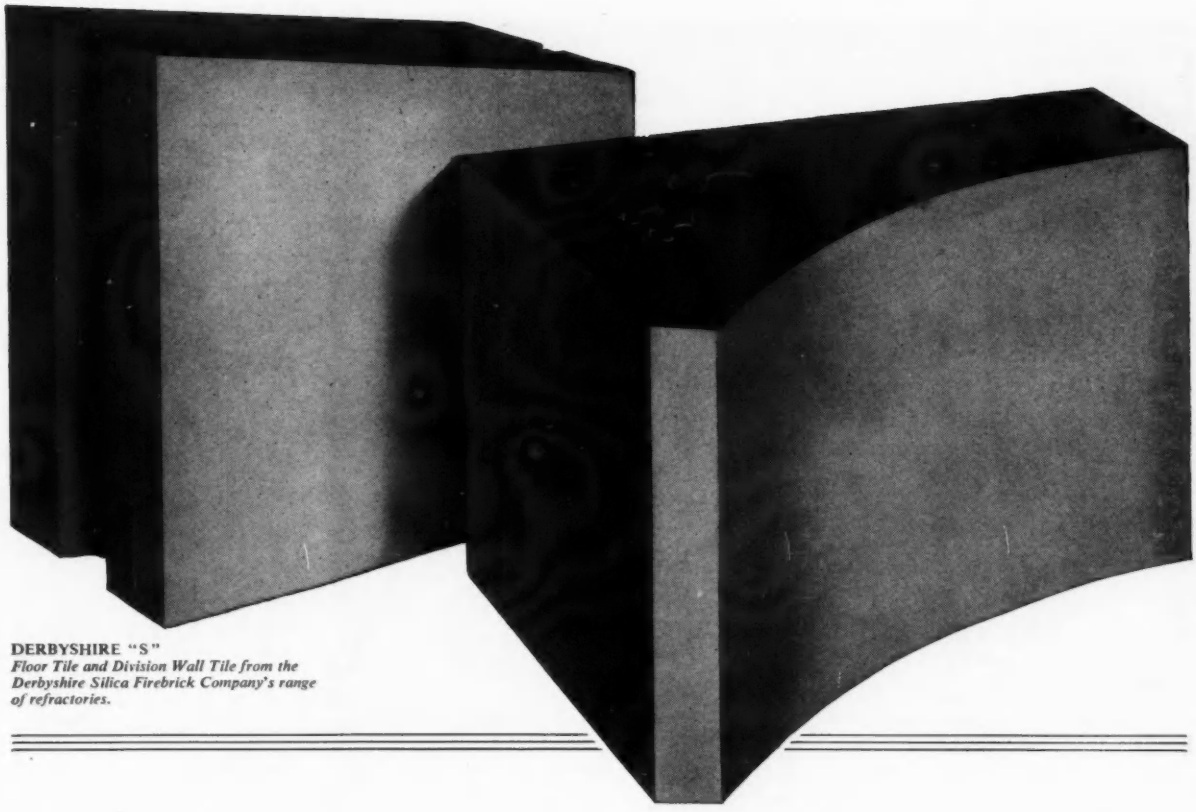

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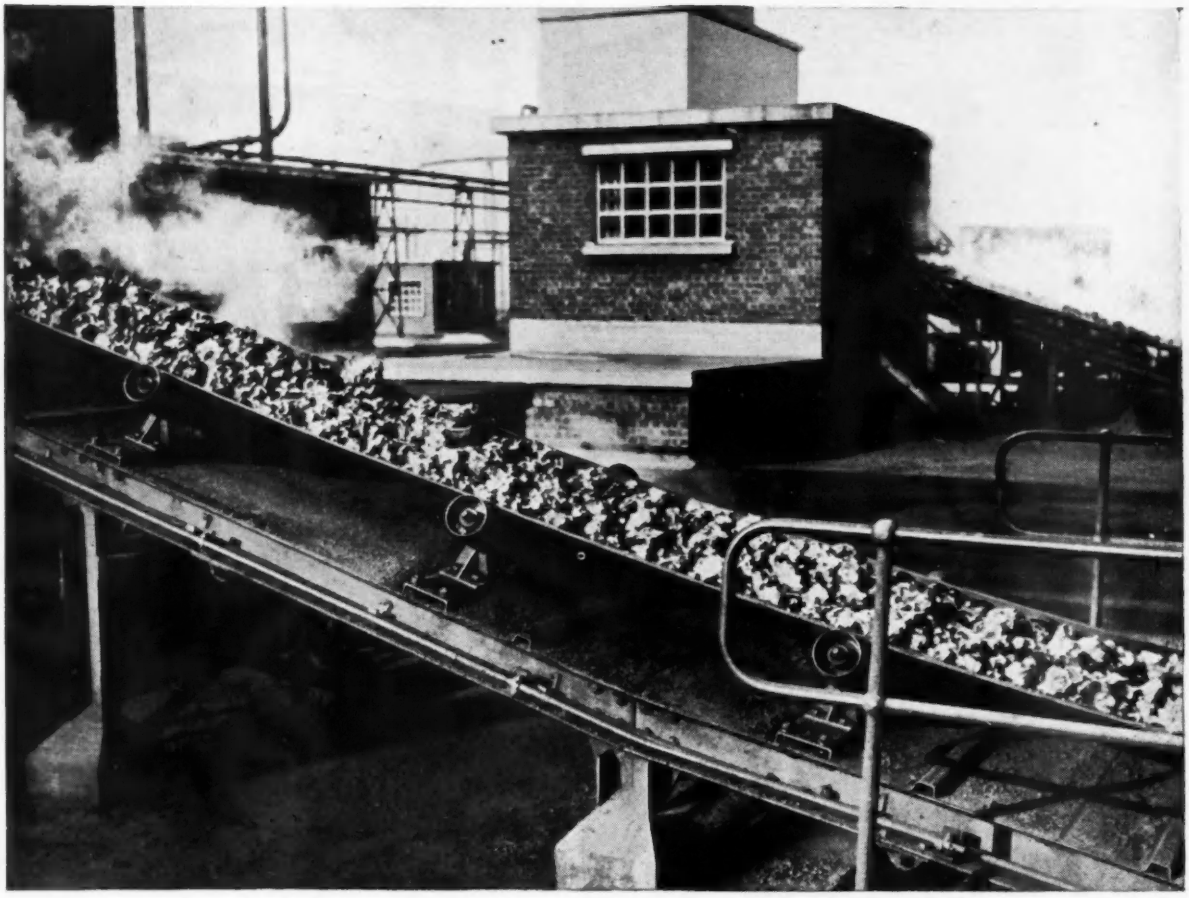

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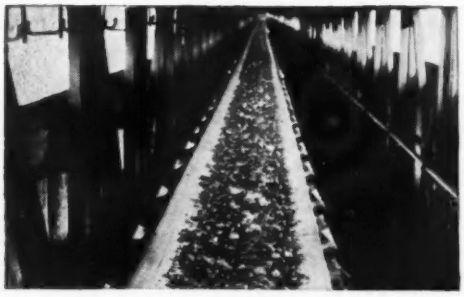

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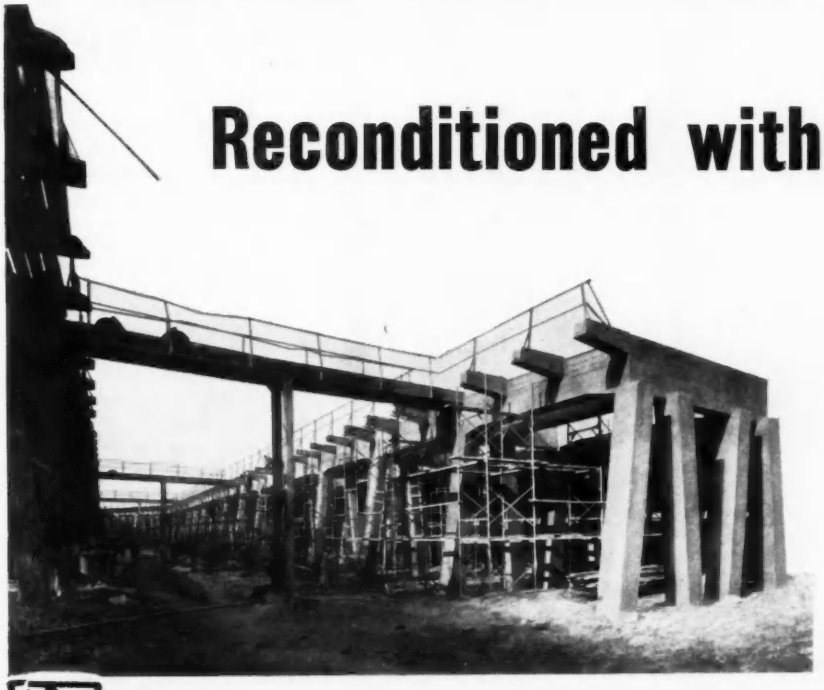

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Gas Journal

VOL. 285 *NO. 4834* *January 25, 1956*

108TH YEAR

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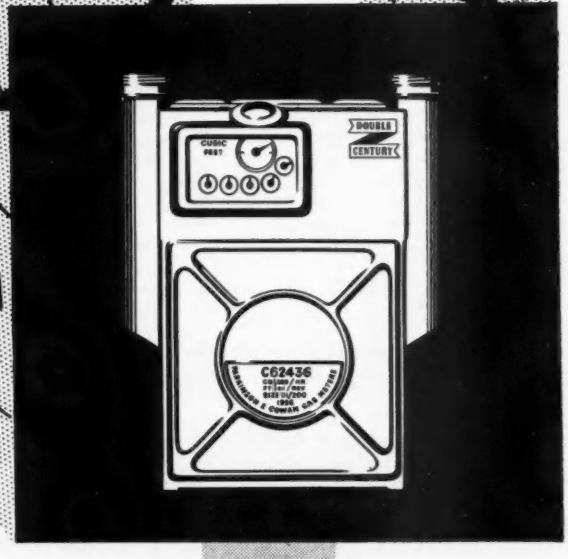

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Gas Journal

VOLUME 285. No. 4834. JANUARY 25, 1956. 108th YEAR

The Industry's Changing Face

THE Jubilee Memorial Lecture to the Society of Chemical Industry was given by Dr. A. Marsden. Although the lecture covered the whole field of gas manufacture and gas utilization from the earliest days of the industry up to the present time with a glance at the future, it contains little that will be new to our readers. In his introduction Dr. Marsden justly claimed that the gas industry ' is essentially British in conception. It has withstood criticism and jest from many quarters and even today suffers by being taken for granted. It is one of the most progressive of our great industries, making ever-increasing use of the various advances and discoveries in the sciences.' It helped ' by the high thermal efficiency of its processes, to conserve the providential asset, albeit a wasting one, upon which much of our former national greatness was built, namely coal.'

The historical section of the lecture was well set out, lightened here and there with a spark of wit. In London ' as many as three or four different supplies were sometimes available in one area, so that questions of ownership frequently arose. It was said, however, that an experienced workman could always tell which company's gas it was by the smell! ' This section was followed by some notes on foreign practice. ' In the Commonwealth and many European countries much of the gasworks carbonizing plant is of British design, although Continental firms have made considerable contributions to ovens and plant for the coking industry.' Dr. Marsden drew on the observations he had himself made in the U.S.A. Nothing made a greater impression on the lay mind than the immense expansion of the gas industry in that vast field of technological advance. ' The American gas industry is the sixth largest in order of capital investment in the United States.' And Dr. Marsden told the story of natural gas and the tremendous development of its use. ' According to the President of the American Gas Association, a total of no less than $2,500 mill. (nearly £900 mill.) will be spent over the next three years on the expansion of the natural gas industry.' On the question of reserves he said: ' At the present rate of use the existing known recoverable reserves are equivalent to about 25 years availability, but, as additional reserves become known each year, it is difficult to estimate the effective overall life of the total supplies.'

Dr. Marsden then described the full range of plant and processes used in the manufacture, purification and utilization of gas. Among possible changes in gas-making processes, ' some of which are operating now,' he listed: (1) Intermittent vertical chamber instead of continuous vertical retorts ' where coal economics dictate and the situation of the plant permits moderate atmospheric pollution '; (2) mechanical producers likely to become standard in all large plants; (3) liquid petroleum gas-air plants for small isolated undertakings; (4) more use of the oil refinery residuals. Longer-term changes, ' most of which will have limited application,' might be gas production by coke ovens at pithead, underground gasification ' more particularly for power production,' production of methane by synthesis, the use of methane from certain mines. The possibilities of oil usage were set out at some length. On purification: ' If the dry purification process is to be controlled closely it is necessary to have a purifying medium of constant quality and in a suitable physical state, and here a synthetic pelleted material, prepared from the by-product copperas of the titanium industry, may prove to be an economic proposition, as well as resulting in the sulphate radical being made to do double duty, first to attack the titanium ore and secondly, during the preparation of the material for gas purifiers, to yield ammonium sulphate by reaction with ammoniacal liquor.' There were also the possibilities of liquid purification methods in the recovery of sulphur ' in its valuable elemental form.' The several methods of removing organic sulphur from gas were described and their desirability was emphasized as leading ' to an increased popularity and more widespread uses of gas.' The advantage of the catalytic processes was that these ' will also decompose the nitric oxide in the gas and thus materially assist in the solution of the gum problem.'

By-products were naturally likely to be of great interest to such an audience as Dr. Marsden was addressing. He had to treat coke both as a by-product and as a main constituent of a dual-fuel policy; perhaps a little more emphasis might have been laid on the

powerful rôle which the gas industry must play in the clean-air policy. The position of tar was being usurped by development of petroleum as a source of raw materials for the chemical industries. The case for the recovery of benzole, whether from tar or from gas, was not as strong as in times of national emergency. And, as to ammonia 'this once-valuable by-product would seem to have become a "Cinderella,"' though 'the use of crude ammoniacal liquor as a direct fertilizer, particularly for grassland' was providing an outlet economical in some cases, as well as providing a solution to some extent of the effluent problem. Here Dr. Marsden noted that it was possible to treat gasworks effluents 'so as to yield a product even better than many normal rivers, but the cost is high.' Treating sulphur as a by-product and its effect on air pollution, Dr. Marsden concluded that 'most of the problems can be solved technically, but the trouble is that people object to paying the price, in fact the world today appears to be blissfully ignorant of the law of conservation which means simply that "one cannot have something for nothing."' Germanium was briefly touched upon; amounts recoverable were small, but the value of this rare and useful metal was of the same order as that of radium.

Storage and measurement were treated at considerable length and returning to the properties of gas itself the importance and usefulness of the Wobbe Index was emphasized. The therm system of charging for gas ensured that the consumer was purchasing a definite quantity of heat potentiality, but it did not represent finality because 'it is necessary in the interests of all to ensure its efficient use,' which could be achieved to a great extent by proportioning the orifices of appliances to the calorific value of the gas divided by the square root of its density. 'Obviously it would be impracticable and unnecessary for appliance manufacturers to supply a separate injector or burner for each possible Wobbe Index, but it is known that the gases supplied by the various gas boards can be grouped for practical purposes into six ranges of Wobbe Index thus simplifying the problem considerably.'

His final section on the future of the gas industry and its place in the national economy is perhaps that which will be read with the greatest attention. After reviewing the position of gas (and coke) in relation to electricity and the coming nuclear energy, he remarked 'in the meantime it is reasonable to ask what developments and changes may be expected from the gas industry within the next few decades.' He saw 'a changing technical picture' the main points of which were: (1) To improve the efficiency of existing plant of all kinds, particularly carbonizing plant to get the maximum thermal results from caking coals; (2) to press forward to complete gasification of coals not suitable for conventional carbonization; (3) to make extended use of petroleum oils and the residuals from refineries; (4) to explore the uses of natural gas from methane in the coal mines to the importation of gases from foreign oilfields.

The lecture as reported in the December 24 issue of *Chemistry and Industry* was concluded with a bibliography extending to no fewer than 119 references. The illustrations were mainly reproduced from lantern slides. We suggest that this lecture, with properly prepared illustrations, might well serve (with naturally a little revision by the author for the purpose) as a general story of the gas industry for issue to the educated lay reader and particularly to technicians in allied industries.

From the Ranks

LAST week the Minister of Fuel and Power, Mr. Aubrey Jones, announced that Mr. James Bowman, Deputy Chairman of the National Coal Board, will succeed Sir Hubert Houldsworth whose Chairmanship expires on July 31. Mr. Bowman, who is 57, is an ex-miner. He was Vice-President of the National Union of Mine-workers from 1939 to 1950, when he became Chairman of the Coal Board's Northern division. From 1946 to 1950 he was a member of the T.U.C. General Council, and he was appointed Deputy Chairman of the N.C.B. following the Fleck Report last February. His new salary will be £7,500 a year. The new Deputy Chairman will be Mr. Joseph Latham who is at present the member of the Board responsible for financial matters. These changes have been announced well in advance in order to enable Mr. Bowman and Mr. Latham to play an appropriate part in a number of major decisions to be taken within the next few months. These include the wage claims from the National Union of Mineworkers to which the Board is to reply on February 9, and the decision whether to persist in trying to import foreign workers in the knowledge of the union's opposition. The previous positions that the new appointees have held indicate that they should be well equipped to tackle these problems.

It is time that some new top personalities attempted to raise the efficiency and production of the coal industry. In previous issues of 'GAS JOURNAL' we have shown that the few areas of the country in which the industry has made recent profits have been those where good industrial relationships have prevailed. Hence we have deduced, making due allowances for differences in conditions and coals, that if better relationships were cultivated in other areas they would be more likely to make profits. Mr. Bowman, who has had considerable experience in dealing with labour disputes should be adequately qualified to investigate this matter. We believe that the gas industry, whose economy is based to some degree on the affairs of the coal industry, will be looking forward to some vigorous activity by the new Chairman.

FELLOWSHIPS IN TECHNOLOGY

The London County Council is inviting applications for the award of the 1956 Robert Blair Fellowship—which is tenable for one year of advanced study or research overseas in applied science and technology. The value of the award varies according to the country chosen by the person to whom the award is made and may be as much as £2,000 if the country selected is Canada or the United States. The closing date for receipt of applications for the 1956 Fellowship is March 1, 1956. Candidates must be natural born British subjects and at least 21 years of age. Fellowships are open to suitable candidates who have been trained in applied science and technology, but preference is given to engineering science.

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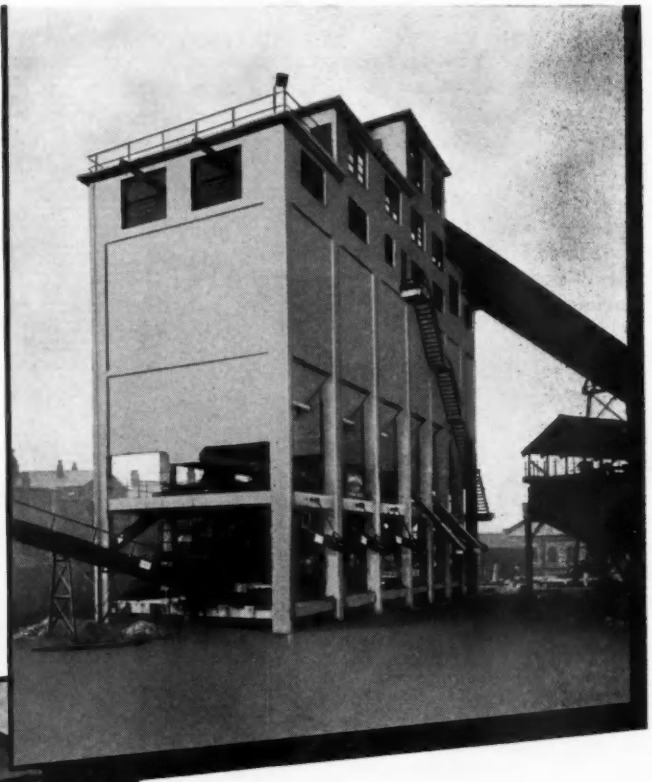

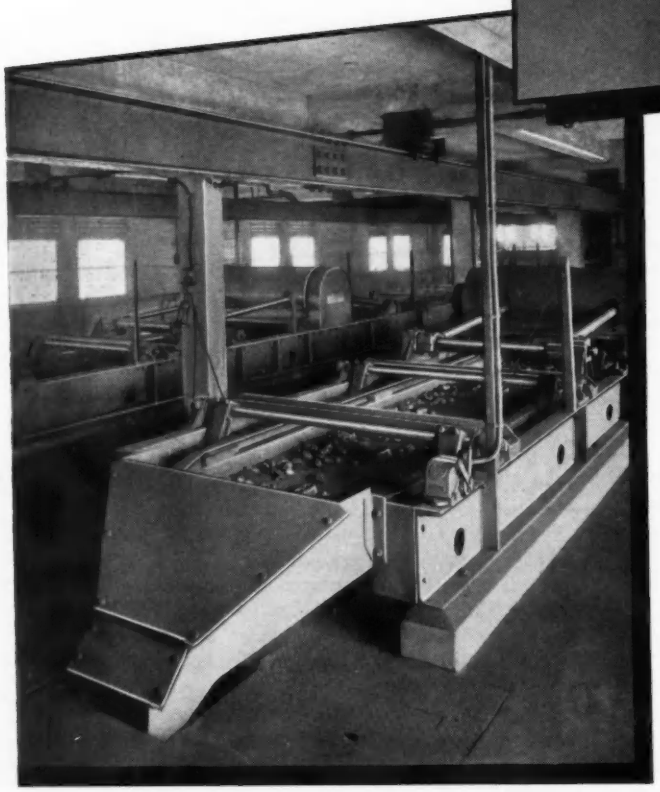

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Personal Notes

MR. JAMES BOWMAN, C.B.E., J.P., has been appointed by the Minister of Fuel and Power to succeed SIR HUBERT HOULDSWORTH, BART, Q.C., as Chairman of the National Coal Board when Sir Hubert's term of appointment expires on July 31, 1956. MR. J. LATHAM, C.B.E., has also been appointed to succeed MR. BOWMAN as Deputy Chairman of the Board from the same date. Both appointments are for five years. Mr. Bowman has been Deputy Chairman of the Board since February, 1955, and was formerly Chairman of the Northern (Northumberland and Cumberland) Division of the N.C.B. Mr. Latham has been a full-time member of the Board since February, 1955, and was formerly head of the Finance Department of the Board.

MR. F. B. OLIVER, who has been Gas Manager at the Johnstone District of the Scottish Gas Board for the last two years, has left for Singapore, where he is to be Deputy Engineer at the City Council gasworks.

ALDERMAN J. H. LEWIS, of Harborne, has been appointed Chairman of the West Midlands Gas Consultative Council in succession to the late Alderman W. H. Malcolm. Alderman Lewis has been Deputy Chairman of the Council and a member since 1949.

Diary

January 31.—SOCIETY OF INSTRUMENT TECHNOLOGY: 'Industrial Measurement of Gas Temperature,' A. M. Godridge, R. Jackson, and G. G. Thurlow. Manson House, Portland Street, W.1. 6.30 for 7 p.m.

February 2.—MIDLAND I.G.E.: Discussion on Coke Symposium introduced by J. Burns, W. R. Branson and F. J. Eaton. Queen's Hotel, Birmingham. 2.30 p.m.

February 3.—INSTITUTE OF FUEL, SOUTH WALES SECTION: 'Research at the National Coal Board,' Dr. W. Idris Jones. South Wales Institute of Engineers, Park Place, Cardiff. 6 p.m.

February 3.—LONDON AND SOUTHERN JUNIORS: 'A Review of Post-War Domestic Gas Water Heating,' G. E. Johnson and C. H. Taylor. Meyerstein Theatre, Westminster Hospital School of Medicine, Horseferry Road, S.W.1.

February 7.—SOUTH EASTERN G.C.C.: Caxton Hall, Westminster, London, S.W.1. 10.45 a.m.

February 7.—MIDLAND JUNIORS: 'Some Aspects of Dry Purification', S. C. Porter. Staff Mess Room, West Midlands Gas Board, Council House, Birmingham.

February 8. — MANCHESTER JUNIORS: Meeting at Liverpool.

February 8.—INSTITUTE OF FUEL, NORTH WESTERN SECTION: 'Some Recent Advances in Fuel Research,' Dr. W. Idris Jones. Joint meeting with National Smoke Abatement Society (North Western Division). Engineers' Club, Albert Square, Manchester. 2.30 p.m. (Members' luncheon 1 p.m.).

February 10.—SCOTTISH JUNIORS (WESTERN): 'Modern Control Equipment,' Gas Showrooms, 522, Sauchiehall Street, Glasgow, C.2. 6 p.m.

February 10.—INSTITUTE OF FUEL, EAST MIDLANDS SECTION: Annual Dinner. 'Black Boy,' Nottingham, 6.30 p.m. for 7 p.m.

February 11. — SCOTTISH JUNIORS (EASTERN): Address by H. H. Grattidge, Area Engineer, N.I.F.E.S. Gas Showroom, Falkirk.

February 13.—ILLUMINATING ENGINEERS: 'Photometric and other Tests for Street Lighting', W. A. Varney. Medical Library, The University, Western Bank, Sheffield, 10. 6.30 p.m.

February 14.—ILLUMINATING ENGINEERS: 'Lighting at London Airport', J. G. Holmes. Lighting Service Bureau, 2, Savoy Hill, W.C.2. 6 p.m.

February 15.—MANCHESTER JUNIORS: Visit to works of Bryan Donkin Co., Ltd., Paper by R. J. Bramhall.

February 15.—INSTITUTE OF FUEL: 'Oil from Coal Project of the South African Government,' P. E. Rousseau. Institution of Civil Engineers, Great George Street, S.W.1, London. 5 p.m.

February 16.—EASTERN I.G.E.: 'Soil Mechanics in Connection with Foundational Construction', M. W. Leonard. 17, Grosvenor Crescent, London, S.W.1. 2.30 p.m.

February 17.—MIDLAND I.G.E.: Spring Meeting. Queen's Hotel, Birmingham. 2.30 p.m.

February 17.—MIDLAND I.G.E.: Paper on utilization of non-coking coal and heavy oil for gas manufacture at Springs, S. Africa, W. Cutler. Queen's Hotel, Birmingham. 2.30 p.m.

February 17. — INCORPORATED PLANT ENGINEERS: Annual dinner. Park Lane Hotel, London.

February 18. — YORKSHIRE JUNIORS: 'Some Aspects of Pressure and Flow Control,' L. Ward. Wakefield.

February 21.—LONDON AND SOUTHERN I.G.E.: 'Peaceful Uses of Atomic Energy,' J. A. Dixon.

Correspondence

OIL GASIFICATION

DEAR SIR,

The Paper by R. B. Brown and R. Hackett and that by R. B. Hobson on the Regenerative O.N.I.A.-G.E.G.I. Catalytic Oil-Gasification Process at Stafford, as reported in the current issue of your Journal, mention prominently the experiment of pre-vaporizing make-oil in the steam regenerator instead of spraying directly on the catalyst, and it appears that this change has been largely responsible for much of the success achieved.

The technique of pre-vaporization originated at York when the 'Segas-Power-Gas' Catalytic Oil-Gasification Plant was first put to work in July, 1954. This fact was mentioned in my contribution to the discussion on the Papers 'Gasification of Residual Oil,' by G. le B. Diamond, C.B.E., and 'Catalytic Gasification of Petroleum Oils' by H. Stanier and J. B. McKean, presented at the Autumn Research Meeting of the Institution of Gas Engineers, 1954.

Quoting from the records, I stated:—

'With minor differences to suit local circumstances, operation was based on Sydenham, with the one major exception that the whole of the oil was injected into the top of the steam preheater. . . .'

I venture to suggest that the adoption of this technique at Stafford has resulted in success which could not have been achieved without it. I am certain that this is so at York.

Yours faithfully,
H. JOHNSTON.

Chief Engineer,
North Eastern Gas Board,
Leeds, 2.

January 16, 1956.

Bangor Meter Men's Wages Up 10%

Following the decision of Belfast Corporation to increase meter inspectors' wages by 10%, Bangor Borough Council has decided to increase the wages of their meter inspectors by a similar amount as from November 1, 1955.

Sales of appliances during the month of November the Manager, Mr. J. A. Derbyshire, reported amounted to £247, which was satisfactory, considering the hire-purchase restrictions now in operation. Cash sales totalled £554 (44.3%). Twenty-nine cookers were sold, 18 to new consumers, and 11 replacement cookers.

Starting with the meeting on Friday, February 3, general meetings of the London and Southern Junior Gas Association, will be held in the Meyerstein Theatre, Westminster Hospital School of Medicine, Horseferry Road, S.W.1. The entrance is at the junction of Marsham Street and Horseferry Road.

Mr. D. L. M. Renton, Parliamentary Secretary, Ministry of Fuel and Power, listening to an explanation of a scale model of East Greenwich Works by Mr. B. C. Hinwood, Station Engineer. Mr. Owen Francis, Under Secretary of the Gas Division, Ministry of Fuel and Power, is standing between Mr. W. K. Hutchison, Chairman, South Eastern Gas Board, who is on the extreme right and Mr. R. S. Johnson, Deputy Chairman of the South Eastern Gas Board.

NEW MINISTRY SECRETARY SEES S.E. WORKS

Mr. D. L. M. Renton, the newly-appointed Parliamentary Secretary to the Ministry of Fuel and Power, visited the South Eastern Gas Board's East Greenwich works on January 13. He was accompanied by Mr. Owen Francis, Under Secretary, Gas Division.

They saw a scale model showing the existing layout and proposed developments at East Greenwich.

Mr. W. K. Hutchison, the Board's Chairman, Mr. R. S. Johnson, Deputy Chairman, Mr. R. Prince, Chief Engineer, Mr. T. W. Gibson, Metropolitan Division Engineer, and Mr. B. C. Hinwood, the Station Engineer, were included in the party.

During the tour of the works Mr. Renton met a number of superintendents and foremen. He also met Mr. M. R. Butler, rotary pump attendant, who is Secretary of the elected representatives, East Greenwich joint consultative committee.

The tour, which lasted two hours, ended with an inspection of the recently re-designed sulphate of ammonia plant at Phœnix wharf.

LISBURN GAS UP BY 1s. 2d.

Move to Avoid Deficit

The price of gas in Lisburn, Northern Ireland, is to be increased by 1s. 2d. to 9s. 8d. per 1,000 cu.ft. with effect from January 1 this year.

The decision was taken at the monthly meeting of the Urban Council on January 2, on the recommendation of the Gas Department who had considered a report from the undertaking's accountants.

The report stated that with the present selling price of gas (8s. 6d. per 1,000 cu.ft.) the undertaking could be expected to show a net deficit of £3,561 for the year ending March 31 next.

Given a continuance of consumption on the level of previous years, with no increase in the costs of manufacture or distribution, an increase of 1s. 2d. per 1,000 cu.ft. would be sufficient to enable the undertaking to operate without loss for the year ending March 31, 1957.

Farewell to 'Finest Gas Lamps in Europe'

WORKMEN have begun dismantling the gas lights in the streets in the centre of Birmingham in preparation for a switchover to 1,000-watt electric lamps, which will more than halve maintenance costs.

Thoroughfares affected by the present changeover, which is expected to be completed by April, are Victoria Square and Corporation Street—the first stage of a plan to electrify all the city's street lighting. The Corporation's agreement with the West Midlands Gas Board ends on March 31.

When the first high-pressure gas lighting was installed in Victoria Square 50 years ago, it was hailed as 'the finest in Europe and probably in the world.' Corporation Street and New Street will still be lit by overhead lamps suspended over the roadway, and in Victoria Square the existing light standards will be retained. An official of the Public Lighting Department said: 'Originally there were two gas lights on each cable across New Street and Corporation Street, but some of these have been removed in recent years. We shall install two 1,000 watt lamps on each cable, so that the lighting will be restored to its original brilliance.' High pressure gas lighting entails a lot of manual attention. For Corporation Street and New Street alone workmen have to be on duty each night to make adjustments. With electricity the fitting of time switches makes the switching on and off of street lighting purely automatic.

Birmingham is now waiting for loan sanction from the Treasury to convert the entire street lighting of the city from gas to electricity. This development approved by the City Council two years ago will cost £1,300,000 spread over 13 years. There are still 24,350 gas lamps in Birmingham streets.

Including fuel, it is estimated that a gas street light in Birmingham costs £9 4s. 9d. a year to maintain, compared with £5 2s. for its electric counterpart. By turning over to electricity, Birmingham hopes to save £65,000 a year.

W-D were actively on site in 1955

25 NEW GASMAKING PLANTS

		Tons coal/day
	Aberdeen V	175
✓	Brighton III	406
	Cambridge III	214
	Christchurch, N.Z.	150
✓	Croydon IV	270
✓	Derby III	380
✓	Dover I	341
	Dover II	341
	East Cowes	245
✓	Edinburgh IV	259
	Edinburgh V	259
	Exeter	377
	Gainsborough III	18
	Glasgow, Provan II	436
✓	Glasgow, Tradeston II	179
	Grimsby VI	80
✓	Irvine III	18
	Lancaster, White Lund	418
✓	London, Kensal Green *(Complete Gasification)*	50
✓	Rotherham	617
	Solihull III	50
✓	Tingley II	511
✓	Tottenham V	557
	Truro	150
	Walsall II	821

15 NEW COKING PLANTS

	Avenue, Chesterfield	2175
	Beckton IV	603
✓	Cardiff IV	963
✓	Ebbw Vale III	444
✓	Ebbw Vale IV	444
	Irlam IV	431
	Monkton II	695
	Moss Bay III	1159
	Orgreave IV	858
	Pretoria V	1089
	Pretoria VI	1089
	Ravenscraig	1608
✓	Redbourn II	353
✓	Stanton II	918
	Vanderbijl Park II	1172

✓ Completed and put to work.

The figures following the Contract names denote the number of installations built at these Works.

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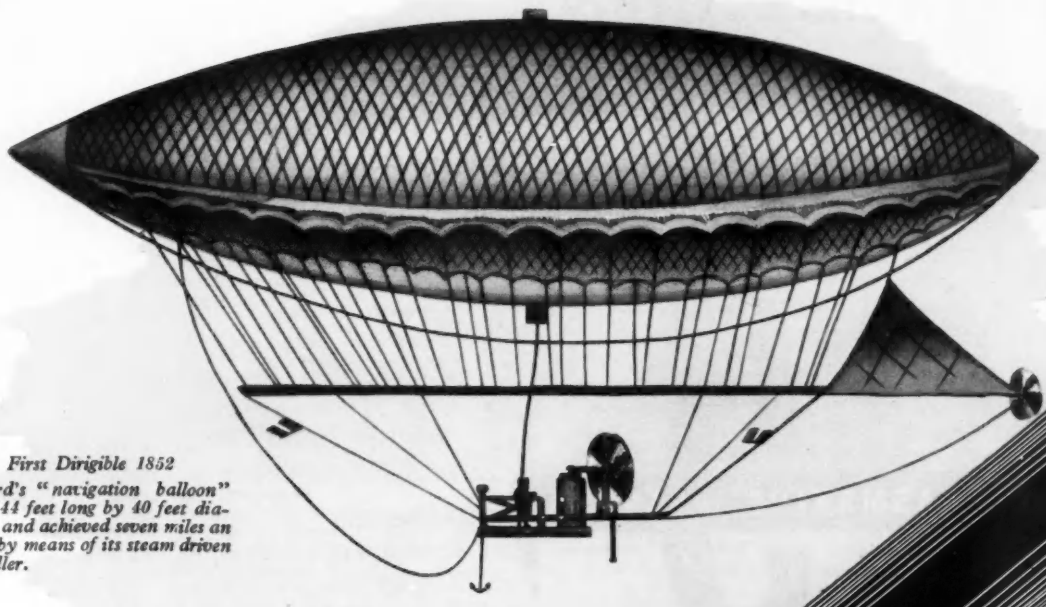

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Giffard's "navigation balloon" was 144 feet long by 40 feet diameter and achieved seven miles an hour by means of its steam driven propeller.

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W-D were actively on site in 1955

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	East Cowes	245
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	Edinburgh V	259
	Exeter	377
	Gainsborough III	18
	Glasgow, Provan II	436
✓	Glasgow, Tradeston II	179
	Grimsby VI	80
✓	Irvine III	18
	Lancaster, White Lund	418
✓	London, Kensal Green (*Complete Gasification*)	50
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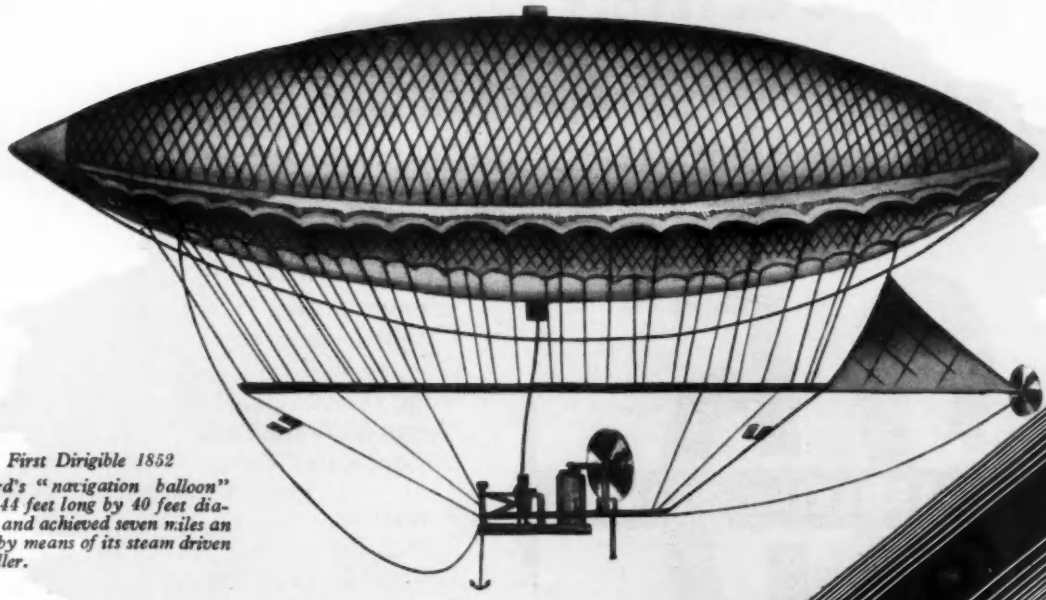

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Investigations So Far Exonerate Carburetted Water-Gas— Sir Robert Nimmo's Report

THERE would appear to be nothing to suggest that carburetted water gas tends towards accidents any more than the ordinary gas, said Sir Robert Nimmo, Chairman of the Scottish Gas Consultative Council, when he presided at a meeting of the Council in Edinburgh on January 11.

He was reporting on investigations which were being carried out by the Chief Engineer of the Scottish Gas Board. The circumstances of 155 fatal incidents in a period of 15 months had been examined, but the information was insufficient for the basing of a correct estimate. It was proposed to continue the investigations over a longer period. 'It is almost impossible to draw a definite conclusion at this stage,' said Sir Robert, 'but there would appear to be nothing to suggest that carburetted water gas tends towards accidents any more than the ordinary gas. I say that with reservations in view of the short-term investigation.'

Sir Robert also explained the position regarding Scottish coal import and exports. He said that 1,000 tons of coal a week were being sent from Scotland to Northern Ireland for gasmaking purposes, the reason being that when the gasworks in Northern Ireland were constructed they were designed to work on Scottish coal. At the same time Scotland was importing about 7,000 tons of coal a week from Northern England and about 2,000 tons from other sources.

The English coal was from the Durham area: 'It is a better quality coal for making gas and is slightly cheaper than the equivalent Scottish coal and is considered to be quite a good bargain from that point of view.' The cost of transport, 30s. a ton, was of course an extra burden.

At an earlier meeting the Council had deplored the effect of the continued rise in the price of coal on the price of gas and the necessity of having to import coal from England. Sir Robert Nimmo had undertaken on that occasion to ascertain the amount of coal which was being exported from Scotland, and the proportion, if any, which was suitable for gas production. He explained then that the Scottish pits were not producing enough coal, and by importing English coal the average price of gas in Scotland was raised by ½d. a therm.

It was reported that local managers of the gas undertakings were now establishing a closer contact through local authorities with elderly consumers and assisting them in the proper and safer use of their appliances.

Economies achieved by the Board since vesting date were mentioned in a report by the Secretary and Chief Engineer. It was recalled that the Board took over an area which was not only the largest and most widespread of all the areas but also had much the largest number of gasworks. These varied considerably in size and condition and most of them had suffered from the impossibility of maintaining an adequate repair, maintenance, and constructional programme during the war years when the use of labour and material was subject to restriction. Another predominant feature in this area was the very large number of small units which were wasteful from all points of view.

Direct operating economies have been sought mainly in the following ways: 1. By higher efficiency in the utilization of coal to produce gas and coke; 2. By conservation of labour, particularly in mainlaying, service laying, service cleansing, meter reading, gas-fitting; 3. By improved office and stores procedures.

The conversion of coal into gas and various by-products is the gas industry's chief activity and therefore the one in which the Board expected to make the most substantial improvements. The measures which were taken to achieve economies in coal utilization were summarized as follows:—

(a) Reconstruction and replacement of units of gasmaking plant which were in poor condition at vesting date, partly due to war-time restrictions and shortages.

(b) The closure of small and uneconomical gasworks after provision of bulk supplies from more efficient units; since vesting date 36 works have been closed in various parts of Scotland, and there are, in various stages of implementation, approved schemes which will allow 23 further closures of this kind.

(c) Attention to the technical operation of gasworks plant. In order to hasten the achievement of savings of this kind, the Board decided in 1952 to experiment with a system of administrative control recommended by a firm of consultants. Results were encouraging and the system has been introduced at most works. It provides for a critical assessment of plant performance under correct working conditions, with a regular check to ensure that standards thus established are subsequently achieved. The system of financial recording which underlies this technique reveals that it has been responsible for more than £120,000 out of the total annual rate of saving. This system of control is in the course of active extension to all undertakings.

North Thames to Spend £500,000 on Tower Box Purifier

The North Thames Gas Board is spending over £500,000 on a tower box purifier to be installed at the Beckton gasworks. It will treat 30 mill. cu.ft. of gas daily.

Henry Balfour & Co., Ltd., of Leven, Fife, have just signed the contract to erect this plant. Work will start shortly, and should be completed in two years.

The Beckton tower purifier will be one of the largest units of its kind in the country. It will be 215 ft. long, 76 ft. high and 100 ft. wide, and will be constructed from 4,000 tons of welded steel.

This will be the third plant of this type that Henry Balfour have installed for the North Thames Gas Board; two similar, though smaller, plants are operating successfully at the Southall and Bow Common gasworks.

Since these installations, the firm have made considerable progress with tower box purifiers, and the one at Beckton will embody all the latest developments and improvements.

The plant, which is mechanically operated, consists of a welded steel container, sub-divided into 15 tower boxes, each containing 16 trays, each tray holding 33 tons of oxide. The total amount of oxide in circuit is approximately 8,000 tons.

Gas enters each box through the large connecting mains, passes down through the oxide and is purified. It is then collected off and goes on to the remainder of the ancillary plant.

When the spent oxide in one of the boxes needs to be changed, this is performed automatically by a mechanical device which tips it from the trays, later re-charging them with fresh oxide. During this operation, the gas normally passing through that tower box is switched to a spare tower box.

Fifteen Film Shows a Week

During the past 12 months, an average of 771 film shows—15 every week—have been presented by the Public Relations Department of North Thames Gas to schools and various adult organizations, societies, *etc.*, throughout the Board's area. The year's audiences totalled 70,000.

'Peak' period was from December 19 to 21 (the pre-Christmas week) when, in the three days, no fewer than 31 shows were put on to a total audience of 6,500 people.

During the summer months, a 'follow-up' letter was sent out to societies who had previously taken a film show from the Board, but who had not approached them for a 'repeat' for over 12 months. Results of these letters can be seen by the fact that in the last three months of 1955, more than three times the number of shows were put on by North Thames compared with the same period of the previous year.

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Recent Developments in Gas Purification

BY D. B. MOORE

B.Sc., A.M.Inst.Gas E., A.M.Inst.F.

DURING the past 20 years there has been a marked change in the outlook towards the removal of hydrogen sulphide from gases. This change has to some extent arisen from the extensive and detailed experimental work that has been carried out on the reactions concerning iron oxide and hydrogen sulphide. Fortunately, most of the findings of this research work and the results of its application to full scale plants have been published. They have shown that considerable improvements are possible by careful control of the operating conditions and many plants are now working satisfactorily at capacities well in excess of the original design figure.

Concurrently, engineers have been seeking to improve the methods and apparatus for carying out purification. For very many years box purifiers have been used with loose materials containing iron oxide as the main reagent. This long experience and the service given by iron oxide in simple boxes have to some degree retarded the development of alternative processes. However, during this period there has been an increasing uneaseiness regarding the future due to several factors.

The box process requires the periodic emptying and recharging of the units—operations which require manual work under objectionable conditions—and it becomes increasingly difficult to obtain labour for this purpose. Secondly, the box process requires a very large ground area both for the plant itself and for storage and treatment of the oxide materials. In some cases this factor may not be important, but in many works where there has been rapid expansion it is very difficult to find a suitable area for the installation of box purifiers.

The necessity for recharging a box at a period of full load can, and frequently does, lead to concern regarding the possibility of traces of hydrogen sulphide passing through the remaining units. This depends on the time required to complete the operation and with large ground-level boxes can assume serious proportions.

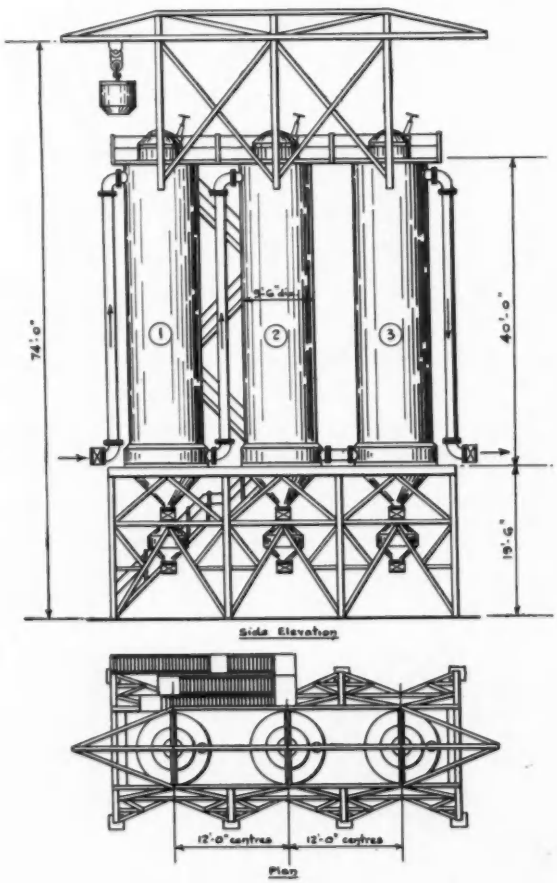

Fig. 1. Gastechnik purifiers. Single 2 mill. cu.ft. per day stream.

Advances in Dry Purification Plant

Much thought has been given to these factors, and plants are now available which are a great advance on the early ground-level boxes. Boxes are now constructed from steel and concrete, as well as the more expensive cast iron, and they are usually built above ground with mechanical handling arrangements. This enables relatively large boxes to be serviced more quickly and with less labour than before, but the capital cost and maintenance charges are increased.

Tower, tower box, and tray purifiers also represent an advance, the first two being suited to large capacities (10 mill. cu.ft. per day and over) and the tray type to smaller capacities, unless ground space is of no consequence. In all these plants it is possible to empty and refill a unit within a working day. Tower purifiers effect an appreciable saving in ground space; on the other hand, the tray type in its present form requires even more space than is needed by elevated boxes.

Mr. Moore, who is in the Research and Development Department of Robert Dempster & Sons, Ltd., presented this paper to the Western Junior Gas Asssociation at Bath.

The foregoing summary of modern forms of oxide purification plant shows that considerable advances have been made in both construction and operation. It is to be noted, however, that no great reduction has been made in the total quantity of oxide required for a given duty. This means that in all cases large quantities of material have to be handled—a process which involves either capital and power for mechanized installations or labour for the simpler plants. In these days either capital expenditure or labour costs largely determine the economics of a process, and consideration has been given to far more complex methods where labour at least has been reduced if not capital expenditure.

Liquid Purification

Liquid purification methods have long seemed attractive due to their low labour requirements, and there are many reagents which have been successfully utilized. These types of plant are generally more complex than oxide plants in both construction and operation, particularly if complete removal of hydrogen sulphide is required. The use of pumps for handling does, of course, eliminate manual work; on the other hand the liability to breakdown, blockages, etc., creates a hazard that must be considered by a gas undertaking, which has to comply with stringent statutory requirements. Liquid processes have much to commend them, but the lack of reserve purifying capacity and their possible breakdown compromise their use alone. It would appear that liquid plants are ideally suited to conditions where it is desired to recover sulphur or hydrogen sul-

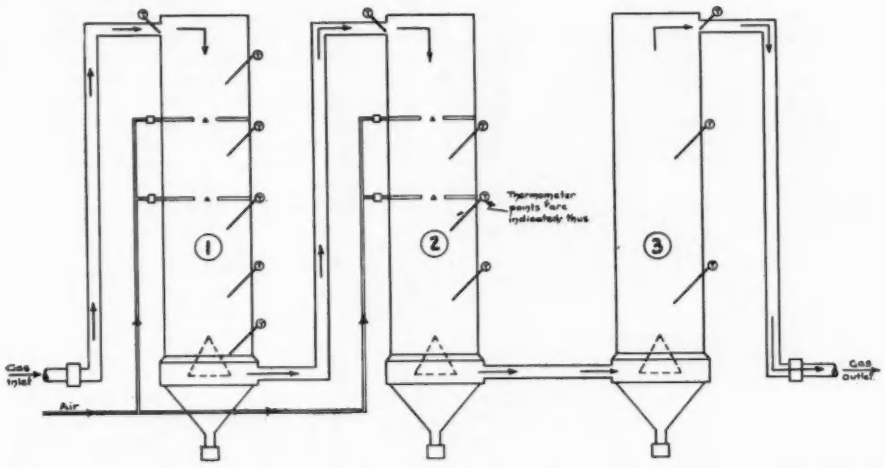

Fig. 2. Theoretical layout of Gastechnik purifier gas flow showing the gas connections together with the air injection arrangements, the flow cones, and the sampling points which are the only restrictions in the vessels.

phide without carrying the responsibility for complete purification.

Many proposals for continuous oxide purification processes have been suggested over the years and many patents have been granted in this respect, some dating back to before 1930. Little or nothing has, however, been published about such processes until recently, although some plants had reached the semi-scale size before work was discontinued.

The first plant to be developed in this country was named the 'dynamic purifier' and was covered by Patent No. 640,065 by W. J. Thorne and the Bournemouth Gas Company. In this plant ordinary oxide material was recycled through a small cylindrical vessel. The gas was passed through this compact bed of oxide and the hydrogen sulphide removed. Oxide was withdrawn from the bottom of the unit through a special valve and was revivified during transport to the top, so that it was again capable of further reaction when recharged. The system was kept in balance by withdrawing a proportion of the fouled material and replacing it with new. Initially this process seemed favourable, although it was reported that back pressures were rather high. I understand that moisture effects on the flow were the main trouble and that work has been discontinued on this process.

A similar type of unit but of more elaborate construction is the subject of Patents Nos. 695,355, 695,382 and 707,178 of recent date, and I am informed that a semi-scale plant is now in operation. It will be interesting to hear if this plant overcomes the difficulties encountered with the 'dynamic' plant. Indeed, if it can use ordinary oxide materials satisfactorily, then the system will have much to commend it.

Williamson and Garside investigated the use of fluidisation in its application to purification. Their researches paved the way to further development, but I am not aware that work has been carried out on any appreciable scale.

The chief drawback in using ordinary oxides for continuous purification units lies in their packing and moisture properties which are liable to cause excessive back pressure, channelling and even blockages. To overcome these difficulties many methods of producing granulated, impregnated or pelleted oxide materials have been patented. Once the material is in a solid uniform regular shape of a size ½ in. or above, then such material, if kept free from dust, will flow by gravity from a container and will also allow gas to be passed through deep beds at relatively high velocities (2 in. to 6 in. per sec.) for a small back pressure.

This immediately opens up the field for intensive purification units of much smaller dimensions than conventional plants. The North Thames Gas Board have experimented with this type of plant since 1945 and recently installed a full-scale unit at one of their works. To date, however, working results of this plant have not been published.

The Gastechnik Purification Process

The Gastechnik process, for which my firm are licencees, is a development of the original German patent taken out by Walter Raffloer in 1927. The process in this country is covered by Patents Nos. 433,823 and 683,432 and Patent Application No. 29455/54. (The German Company is at Oberhausen, Rhineland.)

Over 60 plants are now in operation on the Continent. Most of these plants are purifying gases with H_2S contents below 300 gr. per 100 cu.ft. but the more recent units, particularly those in France, have to remove up to 50 gr. per 100 cu.ft. The limits of gas purity reached in Germany are similar to those required for the Gas Referees' test in Britain.

In the U.K. there is at present only one plant in operation. This is at Royston, Yorkshire, and consists of three cylindrical towers 4 ft. 6 in. dia. by 40 ft. high. These towers are connected in series and the plant removes 700 gr. H_2S per 100 cu.ft. from 500,000 cu.ft. per day. By the end of 1957, plants will

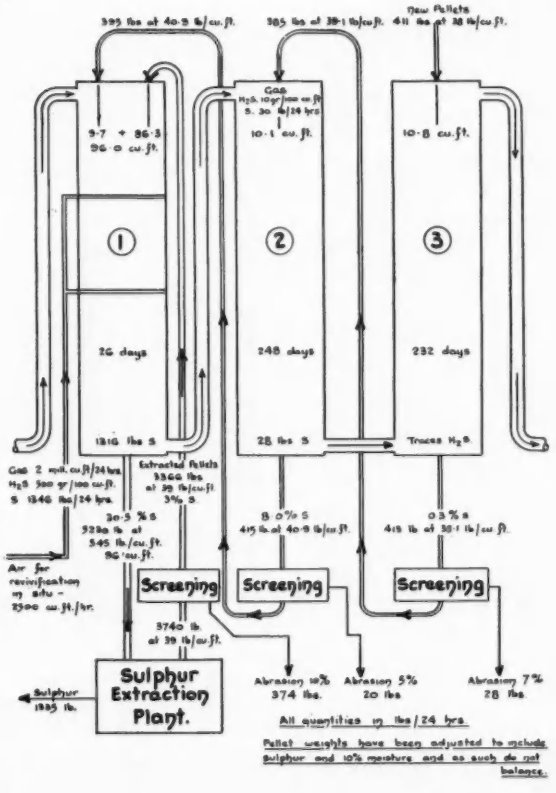

Fig. 3. Flow chart for Gastechnik purification plant with concurrent flow.

be in operation on gases from 20 to 900 gr. H_2S per 100 cu.ft. and one plant will be working at 450 lb. per sq. in.

The essential feature of the process is that tall cylindrical towers are filled with special oxide pellets, forming a continuous compact bed. These pellets, approximately $\frac{1}{2}$ in. dia. by $\frac{1}{2}$ in. long, will flow easily under gravity and can be charged and discharged from the main vessel by means of gas locks, without interrupting the main gas flow. Thus the purification is continuous, although the handling of the pellets is carried out intermittently.

Fig. 1 illustrates a single stream of purification towers 9 ft. 6 in. dia. by 40 ft. high which deals with 2 mill. cu.ft. of gas per day. Three such towers in series can completely remove up to 1,000 gr. H_2S per 100 cu.ft.

The towers themselves are plain cylindrical shells with a cone-shaped bottom reducing the pellet outlet to 8 in. dia. The pellets are charged to the top of the tower by means af a gas lock and are removed from the bottom by a similar means. The handling of the pellets is carried out in bottom opening skips, the capacity of these and the gas locks being similar so that each acts as a measuring vessel.

For most duties the skips are lifted by a 2-ton electric block running on a joist track over the plant. For large plants (over 10 mill. cu.ft. per day) a gantry crane of similar capacity is preferable. The skips can be handled at ground level by using bogies on track, but flameproof electric trucks running on concrete reduce the manual labour and give a more flexible arrangement.

The gas can pass either up or down the towers, and if upwards it is distributed by a gas belt and an internal cone which also serves to give a uniformed flow of pellets down the tower. It has been found that concurrent flow in the first two towers enables complete internal oxidation to be achieved even with high H_2S contents, and so removes the necessity for a separate regeneration system as was originally proposed. With this method up to 4% of air is injected into the towers at positions approximately 10 ft. and 20 ft. from the top. The air injection arrangements, the flow cone and the sampling points are the only restrictions in the vessel; these are shown together with the gas connections in Fig. 2.

The complete flowsheet is given in Fig. 3 for a standard 2 mill. cu.ft. per day stream purifying gas from 500 gr. H_2S per 100 cu.ft. From this chart it can be seen that most of the handling is concerned with No. 1 tower. Screened extracted pellets containing 3% sulphur and 10% moisture are charged to the top of the tower together with a make-up quantity from No. 2 tower. This material when charged comes into contact with the foul gas, and sulphides. The sulphided material passes to the oxidation zone when further material has been charged, and here it preferentially oxidizes. As already stated, the movement of pellets is intermittent and for most installations is carried out daily. The fresh charge of pellets completely removes the H_2S for a period of several hours and then gradually passes more and more until, just before the next charge, it is completely sulphided; the cycle is then repeated. During the first period the sulphiding and oxidizing reactions are completely separated, but for the rest of the cycle simultaneous reactions are taking place. By working a 40 ft. column of pellets in this way it is found that the equivalent of three complete sulphiding and oxidations is possible, giving an exit material in the full oxidized state and containing about 30% of sulphur. This figure of 30% sulphur may appear low, by ordinary standards; indeed, this is the main drawback to using pelleted materials and is worthy of further comment.

When producing a pelleted material, the porosity is the prime factor governing both the reactivity and the degree to which the material can be enriched with sulphur. This porosity is not easy to produce as the size of the pores is also important, particularly in the extraction stage, and the pellets must be sufficiently strong to resist crushing and abrasion. Hence the structure of the pellets is a compromise between porosity and strength. It is possible, however, to produce pellets of adequate strength having a porosity of 50% to 60%. It will be appreciated that these pores fill up with sulphur during the purification process, and hence their reactivity and capacity are reduced, until at 30% of sulphur it is not economic to re-use them without first restoring the porosity by extracting the sulphur. For the same reason the optimum moisture content of the pellets is in the range 8% to 12%, and it is essential to keep the moisture below 18%, as above this figure liquid water blocks the pores and the reaction is then confined to the surface.

Referring again to Fig. 3, it is to be noted that the new pellets fed to the system enter No. 3 tower at a rate equivalent to the total screening losses. In this way the most reactive pellets are in contact with gas containing the traces of H_2S, and by this method complete purification is easily attained. Furthermore, each tower contains about 45 tons of pellets, and this quantity ensures that complete purification can be maintained for several days in the event of any handling breakdown.

The operation of this type of purification plant will clearly require fairly close supervision, and, indeed, this is essential in order to obtain the maximum sulphur loading. Fortunately the H_2S content at the outlet of the first tower gives a clear indication of the performance. The daily recording of this figure, together with the inlet loading and the gas volume, enables the required movement of material to be easily calculated.

(*Continued on p. 225*)

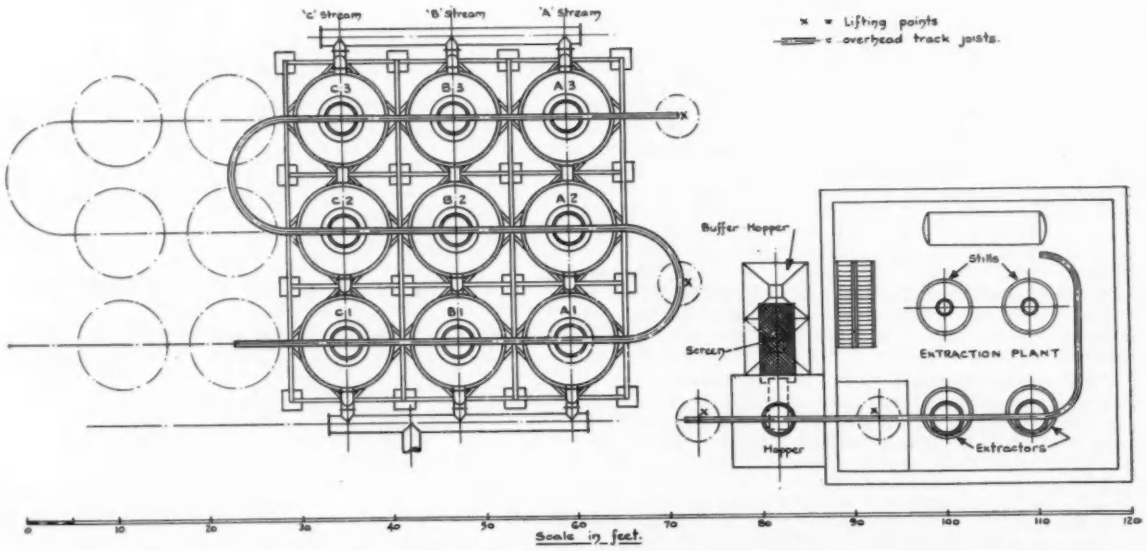

Fig. 4. Plan layout for a Gastechnik plant for 6 mill. cu.ft. per day at 650 gr. H_2S per 100 cu.ft.

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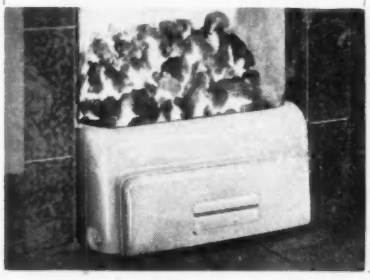

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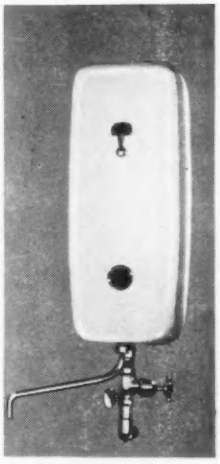

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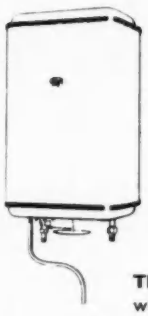

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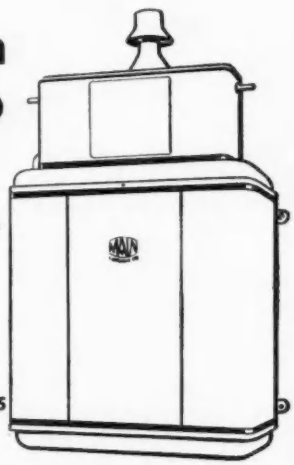

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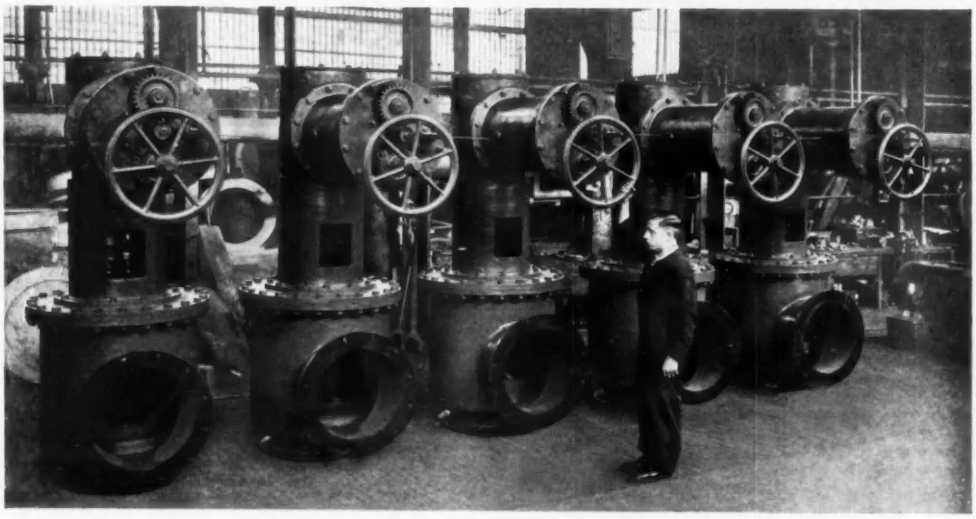

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The movement of material through the plant enables both high and low loadings to be purified economically. It is even possible to work at 100% overload for long periods if the pellet movement is increased; this, however, results in lower sulphur contents and so reduces the operating efficiency. In this respect it is to be noted that the normal back pressure for three towers is only about 4 in. W.G. and is constant as long as the pellets are screened before charging. For 100% overload this back pressure only increased to 12 in. W.G.

The necessity for adequate screening has been emphasized, and a unit is provided with each installation so that this can be carried out easily using the handling skips provided. In most installations this screening unit is incorporated with an extracted pellet storage hopper, and is situated adjacent to the extraction plant.

Sulphur Extraction Plant

The Gastechnik process is only economic for gases of high H_2S content if the fouled pellets are extracted, the sulphur recovered for sale and the pellets re-used for the plant. For this reason an extraction plant is essential and is justified for all plants of 4 mill. cu.ft. and over per day.

The extraction process that has been developed is also of German origin, and utilizes perchlorethylene (C_2Cl_4) as the solvent. This solvent has good solubility for sulphur when hot, is non-inflammable, and has a low specific and latent heats.

The pellets containing 30% of sulphur are treated with successive batches of solvent at its boiling point (121°C.). The hot sulphur-laden solutions are filtered from dust and then distilled, the condensed solvent being returned to storage. The sulphur accumulates at the bottom of the still as a molten layer which is run out into the moulds after removing the final traces of solvent with live steam. The extracted pellets containing 2% to 3% of sulphur are steamed to remove the absorbed solvent and then discharged, ready for re-use in the purification towers. Extraction plants can be based on batch or semi-continuous operation depending on the capacity and the facilities available.

The production of completely pure yellow sulphur is not considered economic at the present time as long as it is possible to market the 98% pure material at a reasonable price.

The new pellets fed into the system are equivalent to approximately 10% of the material charged to the No. 1 towers, and this maintains an adequate replacement of material to compensate for the iron loss due to cyanides in the gas.

A typical plan layout for a 6 mill. cu.ft. per day plant is shown in Fig. 4. This installation is capable of dealing with H_2S contents up to 650 gr. per 100 cu.ft. while operating the extraction plant for 12 shifts a week. The extra towers shown dotted indicate the only additions required to increase the capacity to 8 mill. and then 19 mill. cu.ft. a day by working the same extraction plant for 16 and 20 shifts a week respectively.

The foregoing description of the Gastechnik process is intended to cover only the essential features of this method of purification. It is proposed, however, to make the details of the process, its operation and economics the subject of a further paper.

In concluding I would like to express my thanks to my Company, Robert Dempster & Sons, Ltd., and Mr. B. C. Morton in particular, for permission and facilities to present this paper.

DISCUSSION

The **President** (Mr. D. J. Maunder, Torquay) said that the system appeared to provide the reliable trouble-free operation of normal box purifiers with the low labour requirements of liquid purification.

Mr. C. R. Ingham (Production Engineer and Manager, Bristol/Bath Division, S.W.G.B.) suggested that the plant would prove to be a very big step forward in dry purification. He would like to know how many times pellets could be used in the plant. He was particularly interested in the back pressure figures, for he had known boxes designed for 5 mill. cu.ft. throughput catering for 12 to 13 mill. cu.ft., but this required additional power, which appreciably increased the costs of operation. He would also like to know the reason for filtering the hot sulphur laden solutions and, in this connection, wondered what effluent nuisance there might be with the extraction plant. Was the solvent toxic, did it smell and would there be any danger of dermatitis in handling it?

Mr. Moore replied that the number of times pellets might be extracted and used in the process depended on the screening loss and this in turn depended on the care with which the pellets were handled and stored. Some abrasion loss was desirable to remove cyanides and inerts which concentrated on the pellets' surface and would, but for this, have to be removed by other means. The screens were ¼ in. mesh and the total loss on screening was 10% to 12% of the material cycled through the No. 1 tower and the extraction plant. Filtration of the hot sulphur-laden solutions was carried out to remove pellet dust which would clog pipelines and contaminate the sulphur. Extracted pellet dust was extremely reactive material and could be used to advantage in normal boxes. Its value on a 10% moisture basis was estimated at £3 per ton. Besides the pellet dust, the only other effluent from the plant would be quantities of warm water containing slight traces of perchlorethylene. The solvent, perchlorethylene was toxic inasmuch as it behaved as an anaesthetic when people were exposed to heavy concentrations, but no ill effects were noticeable after consciousness was regained. It had a slight smell. It was of the utmost importance, however, that smoking was not allowed when this chemical was present as, inhaled through a cigarette or pipe, phosgene was produced. To avoid any outlet of solvent fumes, all the vessels and tanks in the extraction plant were vented through an active carbon filter. This filter also acted as a trap for solvent which must be economized at all points in the plant owing to its cost, being £80 per ton. There would appear to be little danger from dermatitis with this solvent as it had been used for many years in the steel industry for degreasing and also in the dry cleaning industry.

Mr. D. W. Scott (Bristol) remarked that it was not often that one had the opportunity of listening to a paper on a new type of plant which had so much to commend it, in economy of ground space, ease of control and flexibility in dealing with large and small flows. One wondered why on the Continent these plants were used to deal with gases having an H_2S content of less than 300 gr. per 100 cu.ft. How sensitive would the pellets be to moisture carried through the plant in droplet or semi-sludge form and what reaction was to be expected if these conditions were to obtain? Was the plant sensitive to temperature changes, and what technical control was required? Did the re-introduction to the plant of extracted pellets which through abrasion had become smaller than standard increase the back pressure, and was there a possibility of air being entrained with the gas when charging or discharging through the airlocks and resulting in an explosive mixture?

Mr. Moore replied that the plants on the Continent were only called upon to deal with gases of an H_2S content below 300 gr. per 100 cu.ft. because the coals carbonized were of a low sulphur content. The porosity of the pellets was the prime factor governing reactivity and the degree to which the material could be enriched with sulphur and, therefore, water in droplet form or entrained sludge would interfere with the reaction and the absorption qualities of the pellets by reducing their porosity. Where excess liquid droplet conditions existed in Germany, this problem had been successfully overcome by the employment of a coke scrubber on the inlet to the plant. Temperature conditions should be adjusted so that the excess condensation took place at the right point—*i.e.*, between the outlet of No. 1 tower and the inlet to No. 2. Some 12 or 13 test points were provided for temperature, pressure and gas sampling. It was found in practice, however, that the H_2S tests on the outlet of the first tower could be used to control the whole stream, and the recharge programme could be based on this figure. The flexibility of the plant was such that traces of H_2S could be cleared up in a matter of 20 minutes by the introduction of two fresh skips of material to the first tower. Daily recharging of the plant should be carried out according to the volume of gas passed and the H_2S content and must, of course, be recorded. The figure of 10% abrasion loss per cycle for pellets varied from plant to plant depending on the care with which they were handled and stored.

(To be concluded)

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It is intended that the successful applicant shall be appointed to the Board of Directors after he has proved satisfactory, and that he shall be appointed Managing Director in about five years.

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Candidates for the appointment must have had experience of administration and sales development and possess appropriate technical qualifications, particularly in respect of gas distribution.

The commencing salary will be within Grade APT 11 (Provincial 'B'—£770/£895 per annum). If required a house will be made available at an agreed rental.

The position is pensionable, and the successful candidate will be required to pass a medical examination.

Applications, stating age, qualifications and experience, together with details of present and previous appointments, should be received by the undersigned not later than February 3, 1956.

C. B. MAWER,
Secretary.

Wales Gas Board,
2, Windsor Place,
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WALES GAS BOARD

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APPLICATIONS are invited for the position of SENIOR CHEMIST in the Cardiff Undertaking.

Applicants must be capable of supervising all the routine gasworks tests, including the analyses of coal, coke and by-products.

Experience in the carbonising industry is an essential qualification.

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The successful applicant will be responsible for all aspects of consumer service within the above district, including the organisation of gas installation and maintenance staffs, the control of showrooms and general administrative co-ordination.

Applications should be made on the official application form obtainable by writing to the Chief Personnel Officer, N.W.G.B., Liverpool Group, Radiant House, Bold Street, Liverpool, and should be returned to him within 14 days.

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APPLICATIONS are invited for the position of EDUCATION and TRAINING OFFICER on the Board's Headquarters Staff. The Officer will be stationed in Edinburgh, but will be required to visit other parts of Scotland. The salary will be dependent on experience and qualifications, but will be about £1,000 to £1,250 per annum. Essential qualifications include organising and administrative ability, and knowledge of educational methods and industrial training. The successful applicant will be required to pass a medical examination and to join the Board's Superannuation Scheme. Applications giving details of age, qualifications and experience, should be addressed to the undersigned to reach him within fourteen days of the appearance of this advertisement.

A. T. HERD,
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Applications giving details of age, experience and qualifications should be sent to A. L. Higham, Esq., Group General Manager, North Eastern Gas Board, Bankside Works, Sculcoates, Hull, so as to arrive not later than February 13, 1956.

J. C. GARDNER,
Secretary.

PATENTS

THE Patentee of British Patent No. 639193 relating to "Improvements in Multiple-way Gas Cocks" desires to dispose of his rights either by way of sale or licence on a royalty basis. In the first instance please communicate with Eric Potter and Clarkson, Chartered Patent Agents, 317, High Holborn, London, W.C.1.

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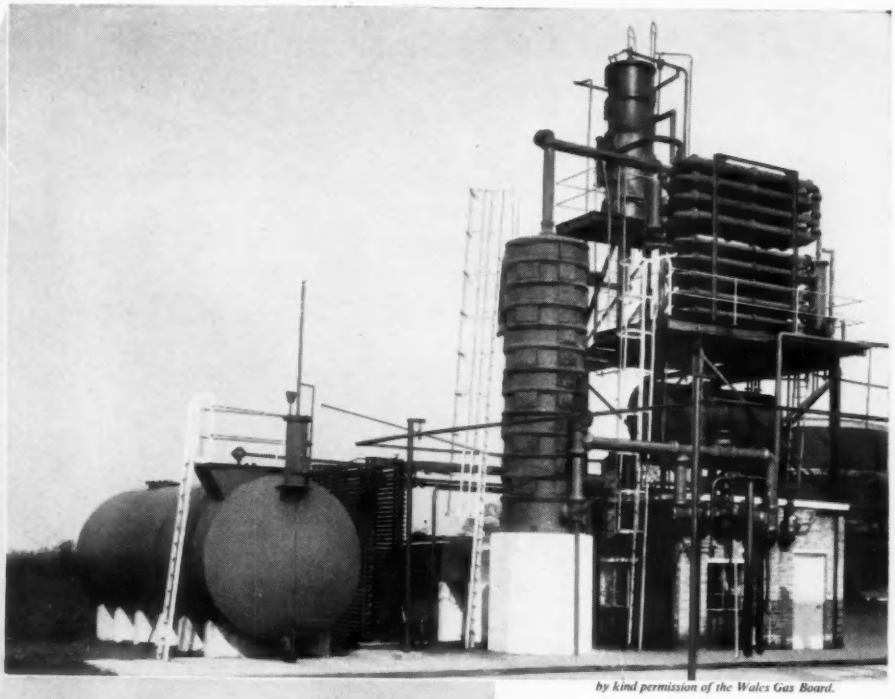

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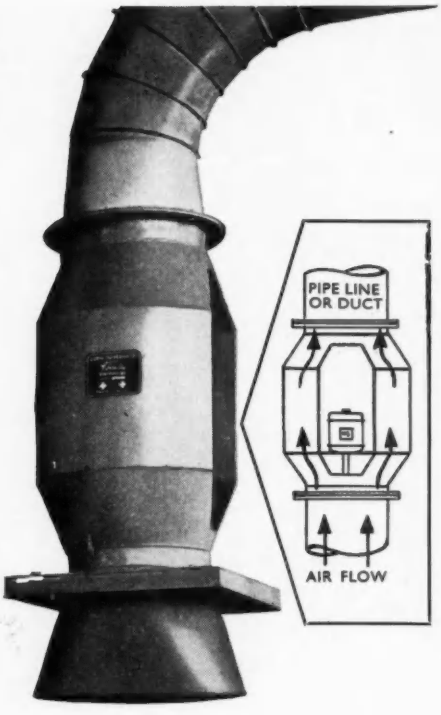

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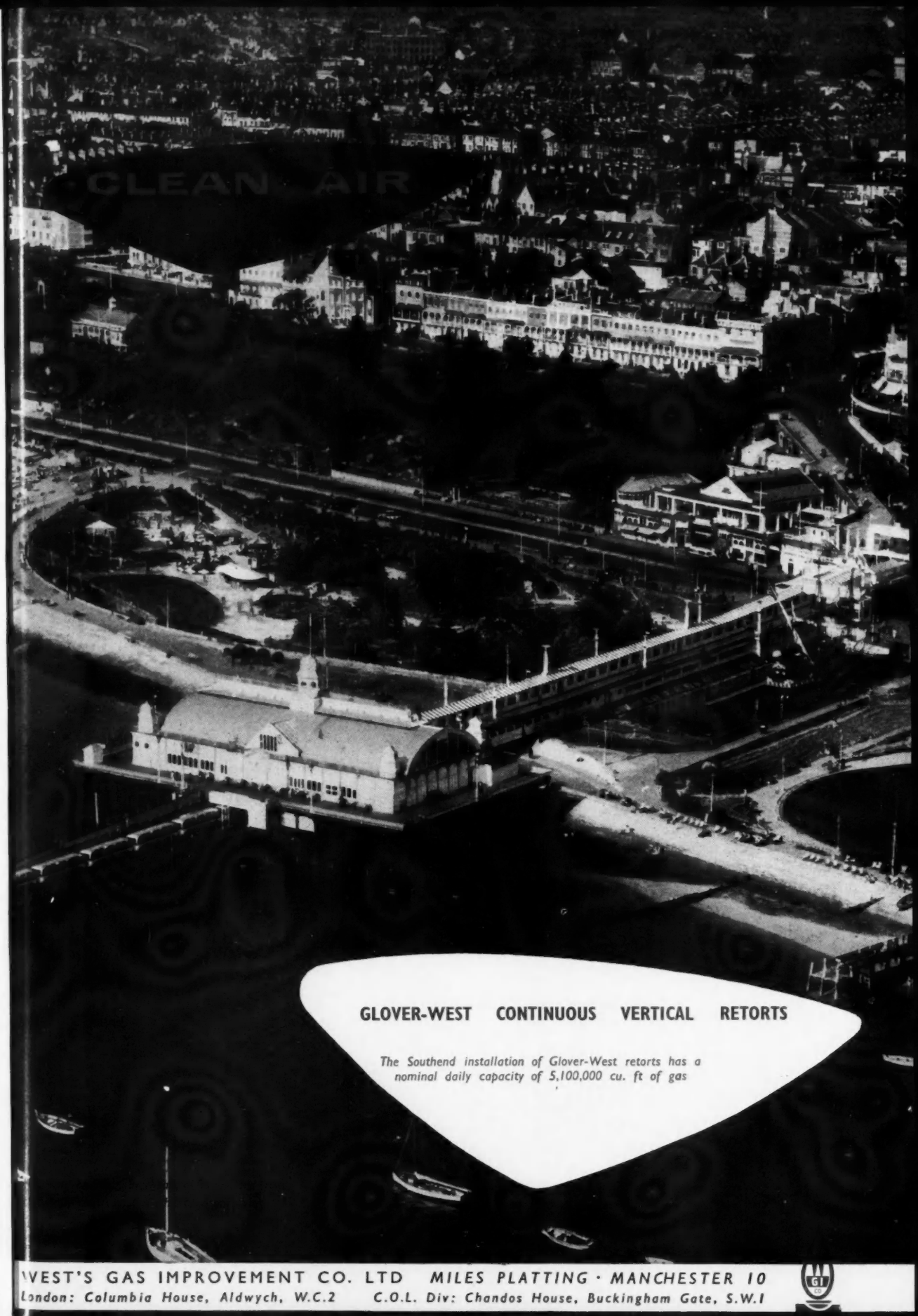

GLOVER-WEST CONTINUOUS VERTICAL RETORTS

The Southend installation of Glover-West retorts has a nominal daily capacity of 5,100,000 cu. ft of gas

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London: Columbia House, Aldwych, W.C.2 *C.O.L. Div: Chandos House, Buckingham Gate, S.W.1*

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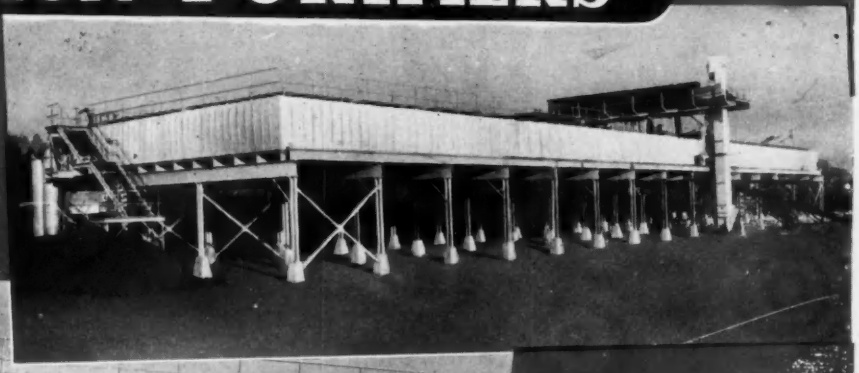

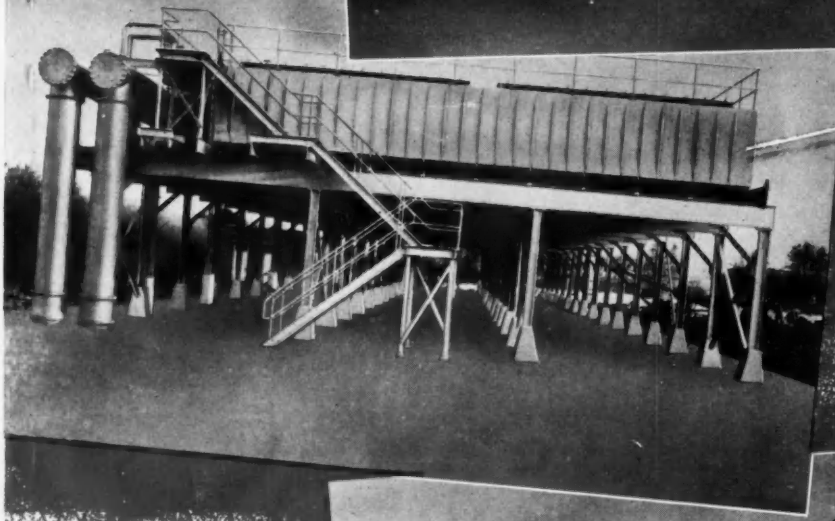

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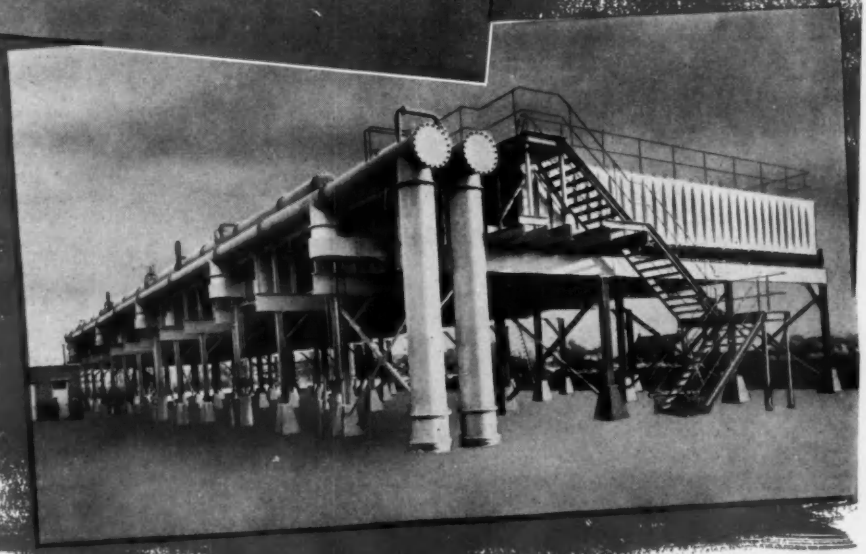

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A set of Cast Iron Elevated Purifier Boxes of 6 mill. cu. ft. capacity.

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